









# Chemical Engineering Catalog

1921

(SIXTH ANNUAL)

EDITION

Collected, Condensed and Standardized  
Catalog Data of Equipment, Machinery,  
Laboratory Supplies, Heavy and Fine  
Chemicals and Raw Materials used in the  
Industries Employing Chemical Processes  
of Manufacture

with

A General Directory of Such Equipment  
and Materials, Classified and Cross-Indexed

and

A Technical and Scientific Books Section,  
Cataloging and Briefly Describing a Prac-  
tically Complete List of Books in English  
on Chemical and Related Subjects

Published by

*The* CHEMICAL CATALOG COMPANY, *Inc.*

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New York

# DISTRIBUTION

## of the Chemical Engineering Catalog

The Catalog is *leased at \$2.00 a copy*, for the period of one year, to those included in the following-named classifications, with the understanding that upon publication of the succeeding volume this copy is subject to recall.

1. Chemical Engineers, Works Managers, Superintendents, etc.
2. Consulting, Designing and Constructing Engineers in Chemical lines.
3. Chief Chemists of Industrial and Research Laboratories.
4. Heads of Chemical Departments in Universities, Colleges, and Technical Schools.
5. Technical Departments of the United States and Foreign Governments, and Libraries.
6. Foreign Chemists and Engineers.

To those not included in the above classes a charge of \$10.00 a copy is made for the volume. Eleven thousand five hundred copies of this edition have been printed for distribution.

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CO-OPERATION on the part of all included in the regular distribution, by mentioning the Catalog when communicating with the firms whose products are described or listed therein, is of the greatest assistance to the publishers in their efforts to make each successive edition a larger and better reference work for the chemical field.

The firms who use space in the Catalog are naturally interested in securing direct and visible evidence that their investment is a profitable one. By consistent mention of the Catalog in communications addressed to them they will be assured on this ground; and, moreover, will be encouraged to supply more detailed data in succeeding volumes, thus increasing the reference value of the work to all its users.

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## The Chemical Engineering Catalog Defined

Described in general terms, the Chemical Engineering Catalog is the official, standard work of reference for Chemical Engineers, Works Managers, Purchasing Agents, Operating Engineers, and others who buy and specify equipment and materials in the various industries using chemical processes of manufacture.

Stated more specifically, it is a compilation of condensed catalog data of manufacturers supplying this field, standardized as to page size and typographical arrangement, supplemented by a General Classified Directory of equipment, supplies and materials, and bound into one volume for convenient reference throughout the year. It is a room-full of individual catalogs, abstracted, indexed and assembled within the covers of a single book.

The volume is published annually under the supervision of an official Committee, appointed by the American Institute of Chemical Engineers, the American Chemical Society and the Society of Chemical Industry. The members of this Committee, whose names appear elsewhere in the introductory pages of this volume, have no financial interest whatsoever in the publication of the Catalog, but are giving their time and attention to the supervision of the work from a realization of its great practical usefulness, and a public-spirited desire to see it well and thoroughly performed.

The field of the Chemical Industries is a broad and vital one, embracing as it does such lines of manufacture as Sugar Making and Refining, Fertilizer, Cement, Paints and Varnishes, Prepared Foods, Leather, Textile Bleaching and Dyeing, Paper and Pulp, Rubber, Metals, Oils, Soap, Extracts, Glass and many others, in addition to the enormous output of Chemicals and Acids themselves. All such lines are necessarily under the manufacturing direction or supervision of men of chemical training or experience, whose work in actually turning out the finished product is constantly reinforced and advanced by the great experimental and research army working in the technical schools and the industrial plant laboratories.

The main purpose of the Chemical Engineering Catalog is to *inform* this vast market, rather than to advertise to it in the usual way. By authority of the Supervising Committee, which directly represents the wishes of those who use the volume for buying purposes, the Publishers are required to exclude all general claims, exaggerated statements, and display material, and to use every effort to develop and encourage the publication in the catalog pages of precise data, such as specifications, construction details, tables of sizes and capacities, and specific uses or adaptations of equipment and materials.

It should be borne in mind that in all these industries where chemical processes are employed, the chemical engineers or others in charge of production must be responsible not only for the operation of the specifically chemical equipment, but also for the power plant and all the other departments of the factory, because these must be intimately connected in operation with whatever chemical apparatus may be used. Therefore, it is apparent that the Chemical Industries afford a most important and direct market for the manufacturers of Power Plant Equipment, Hoisting, Conveying and Elevating Machinery, Power Transmission Equipment, Testing, Measuring and Recording Apparatus, Construction Materials—in fact, every item that enters into the construction and operation of any class of industrial plant.

An important feature of the service rendered to firms represented in the Chemical Engineering Catalog is the furnishing each year of a printed Distribution List to every space user, showing the names and addresses of the firms and individuals to whom the Catalog is distributed. This Distribution List, carefully revised and brought up to date annually, is not for sale under any conditions, but is furnished without additional charge for the exclusive use and benefit of the firms who carry space in the Catalog. The distribution of this edition of the Catalog is 11,500 copies guaranteed.

It will be seen that the service offered through the Chemical Engineering Catalog is an extremely valuable one for the manufacturer of any of the wide range of products used and applied in this field. It is in no respect competitive with the functions of display advertising in journals or trade papers, but stands alone as a direct, permanent and economical information system, completely covering the entire worth-while buying power of the Chemical Industries.

## Acknowledgment

To the following-named Committee, appointed by The American Institute of Chemical Engineers, the American Chemical Society and the Society of Chemical Industry to supervise the compilation and formulate the specifications and standards of the Chemical Engineering Catalog, we take pleasure in expressing our renewed acknowledgments and thanks for the invaluable counsel and assistance which they have so freely given in furtherance of our work:

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A communication from the Committee concerning this, the 1921 (Sixth Annual) Edition of the Chemical Engineering Catalog, appears on the following page.

An expression of our further appreciation is also due for the helpful cooperation and many valuable suggestions received from individual members of the three Societies.

*The Chemical Catalog Company, Inc.*

## A Statement from the Committee on The Chemical Engineering Catalog

The present issue of the Chemical Catalog marks the sixth year of the enterprise. It has many improvements in itself, and moreover it measures the advance which the whole proposition is making in its chosen field of informative chemical technology.

The present volume does not show the growth recorded in previous years, but, considering the state of business affairs, the Committee is of the opinion that the number of firms represented and volume of material included are highly satisfactory.

The statistical report made by the Company is as follows:

	1916	1917	1918	1919	1920	1921
Number of firms using space	132	247	439	604	748	667
Average number of pages per firm	1.5	1.40	1.33	1.40	1.44	1.54
Maximum number of papers to one firm	8	18	20	22	22	95
Catalog pages	205	347	578	850	1048	971
Number of copies printed	8500	8500	10200	11200	11500	11500

It is gratifying to note, in examining these statistics, that there is an increasing tendency on the part of space-users to use more space than formerly. The percentage of increase, although slight, shows progress in line with an important underlying purpose of the Catalog, viz. To have space-users use enough space to properly catalog their products.

There is general improvement in the makeup of the volume. In order to lessen the weight of the book, which was becoming unwieldy as it grew, the publishers have produced it in new format with flexible leather-cloth covers and a thin paper which is a good paper on which to print illustrations. The volume thus becomes several pounds lighter

*Continued on Next Page*

# Requirements for the Preparation of Copy and Digest of Typographical Specifications Adopted for the Chemical Engineering Catalog

## PURPOSE AND USE

The Chemical Engineering Catalog is a standardized reference work, not a display advertising medium, and therefore requires a special style of copy if the best results are to be secured.

The users of the book, Chemical Engineers, Factory Managers, Chemists, Operating Executives and Purchasing Agents, refer to its pages for detailed information; therefore display advertisements are unnecessary, inadequate and out of place. The Classified Directory of Equipment and Materials directs the intending buyer to your pages. *Definite facts should be presented, including careful descriptions of the equipment or materials cataloged, tables of sizes, capacities, properties, etc.; illustrations where required, and suggestions regarding uses, in various industries and under varying conditions. Generalities and "selling talk" are not in keeping with the purpose of the work and are therefore not acceptable.*

## TYPOGRAPHICAL SPECIFICATIONS

These typographical specifications have been approved by the Committee supervising the publication of the Catalog on behalf of

The American Institute of Chemical Engineers,

The American Chemical Society,

The Society of Chemical Industry,

to secure that uniformity which is so essential to and fundamental in a technical and business reference system, as distinguished from a directory or display advertising medium.

It is hoped that all space users will realize that these standards have been created, not to impose arbitrary restrictions upon the presentation of matter, but rather to create additional values for all users of the book—both those who want to buy from its pages and those who offer equipment, materials or services to the Chemical Industries of America by means of The Chemical Engineering Catalog.

**Dimensions**—The size of the type page is 7 x 10 inches, which includes the running head at the top, added by the publishers. The exact space available for copy is 7 x 9½ inches. There are two columns to the page, each 3¼ inches (20 picas) wide.

**Order of Arrangement**—A headline consisting of the firm name appears at the top of the first page of each representation. One line stating very briefly the nature of the business may, at the option of the space user, appear immediately beneath the firm name. The main address follows on one or more lines, together with the addresses of branch offices and plants, agents, foreign connections and cable address, if any. This heading is followed by the body of the Catalog.

**Products Paragraph**—A "Products" paragraph, or its equivalent—"Services," must be included and appear at the top of the first column in each individual catalog. This paragraph to mention by name, without extended description, the products, equipment, materials, or services offered.

**Style and Size of Type**—The standard type for the name of the company is 18-point Century Bold

caps; for the description line, if used, 14-point Caslon, upper and lower case. The main address is set in 12-point and addresses of branches and plants in 6-point, upper and lower case.

The body of the catalog is set in 10-point Old Style, each subject being indicated by a brief title set in 10-point Old Style Antique caps, subdivisions in 10-point upper and lower case bold-face type. Specification forms, testimonials and other quoted matter are set in 8-point; tables, price lists, and titles to illustrations in 6-point. In no case is type larger than 18-point or smaller than 6-point employed. No deviation from styles or sizes of type mentioned is permissible.

## ILLUSTRATIONS

Illustrations should be used whenever possible to convey information of value to the user of the book, but not otherwise. Cuts, special lettering, etc., designed for display or for ornament, and which do not illustrate the text, are inadmissible.

**Cuts**—In cases where it is desired to show the construction or engineering details of an article, line engravings are usually clearer and more effective than half-tones, and the use of the former is recommended for such purposes. Half-tones should not be finer than 133-screen to secure the best printing result. Deeply etched original cuts should be furnished. If electrotypes are used they should be new and in perfect condition. Cuts made by the publishers are charged for at best prevailing prices.

**Trade-Marks**—Reproductions of a firm's own trade or brand mark may appear in the heading or elsewhere on the page, such cuts to occupy space not in excess of one and one-half square inches. (A round trade-mark may be one inch in diameter.) The same trade or brand mark not to be used more than once in the same firm's space.

**Titles (Captions)**—A title must appear under every illustration. Such titles should briefly describe the illustration in the clearest and most concise language.

## CLASSIFICATION

The 1921 Edition of The Chemical Engineering Catalog includes four sections: (1) The Classified Directory of Equipment and Materials, compiled by the publishers. (2) The Equipment Section. (3) The Chemicals and Materials Section. (4) The Technical Books Section. Catalogs are placed in their proper section and in alphabetical order by the publishers. This arrangement has given absolute satisfaction to users of the volume and is impartial to all firms. The only departure from strict alphabetical sequence is in those rare cases where a succession of two or four page catalogs necessitates a slight shifting from the exact alphabetical order of a catalog containing an odd number of pages.

## INDEXING

For the sake of accuracy and as a guide to us in compiling the Classified Cross Index and Products Directory, all copy should be accompanied by a list of products which should properly be included in this section of the volume, these items being subject to editorial revision.



# Information Bureau Service

Beginning January 1st, 1921, our Information Bureau Service was placed on an annual charge basis, the subscription fee being twenty-five dollars for any firm or individual using the service.

The service furnished by the Bureau is roughly defined as follows:

1. Information as to names and addresses of manufacturers and sources of supply of chemical machinery, scientific apparatus, chemicals, raw materials and supplies, power plant equipment - in fact, everything that enters into the erection and maintenance of any kind of industrial plant or laboratory where chemical processes are employed. When required the Information Bureau will suggest the most suitable firms to approach concerning complete lists of equipment required for new plants or additions.
2. Market information as to the USES of various chemicals and materials; prices, past and present; whether or not these substances are imported or made in this country, and in what quantities or proportion.
3. Statistics of production, exports, imports, etc., of chemicals, raw materials, ores, oils, etc.
4. Miscellaneous information concerning the location, personnel, products, etc., of any branch of the industrial chemical field.

In addition to the services outlined above, the Bureau is in a position to render special services and supply reports of a special nature, at rates to be agreed upon in advance.

## What the Information Bureau Does NOT Do

It is important to keep in mind the kind of information the Bureau will *not* furnish. It will not perform any consulting chemical or engineering services. It will not render advice or make suggestions as to the comparative merits of various makes of equipment. It will not give information as to financial or personal responsibility concerning any firm or individual. It does not secure positions for chemists, nor employees for firms. Those in need of this latter service should apply to the Bureau of Employment of The Chemists' Club, 52 East 41st Street, New York City.

## Five Years of Unusual and Satisfactory Service

For more than five years the Information Bureau has been furnishing industrial firms and professional men with the most unusual service, entirely without charge. The demands on it have been constantly increasing at such a rate that the Bureau has been obliged to expand to the point where we feel that the cost of its maintenance should be partially borne by those it is serving.

The Bureau is in charge of an experienced chemist, with assistants who are chemical engineers and chemists, and the work is conducted under the general supervision of the Technical Editor of the Chemical Engineering Catalog, who has at his service for consultation other chemists and engineers on the Catalog's technical staff.

During the five years of its existence the Bureau has accumulated valuable files and data to meet its peculiar requirements and has access to numerous public and private technical libraries in New York and elsewhere.

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*The Chemical Catalog Company, Inc.*  
One Madison Avenue, New York, U. S. A.

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## Classified Directory of Equipment and Materials

This Catalog is primarily a source of information as to MANUFACTURERS. In a few cases, however, it has seemed advisable to include others who are not first hands. By instructions of your Committee, the mark \* is used to indicate that while a firm is a source of supply for the commodity in question, it is, so far as our records show, neither a manufacturer nor an exclusive agent for a manufacturer.

Firms using *catalog space* in our Chemicals and Materials Section do not in any instance carry this mark, for the reason that information regarding the ability of such firms to supply the commodity in question is furnished more specifically to the buyer in their own announcements. Such firms appear in this directory in **heavy faced letters, followed by** the number of the page whereon their facilities and products are stated.

In our *Catalog* pages we aim to carry the announcements only of firms which are actually manufacturers, or the exclusive or territorial sales agents of manufacturers.

All products are indexed under the main noun. For example, for "Steam Jacketed Kettles" see "Kettles, Steam Jacketed."

Chemical salts and other compounds are listed under the *base*, not the *acid*. For instance: "Sodium bichromate" not "Bichromate of Sodium." In all cases it has been the rule to adhere to recognized modern chemical nomenclature, but in cases where an unsystematic or old name is of technical importance, or is better known than the scientific name, a cross-reference is given. For instance, under "Sugar of Lead" will be found a cross-reference to "Lead Acetate."

In indexing organic compounds the prefixes "alpha," "beta," "meta," "ortho," and "para," are placed *after* the name of the substance to which they apply: e.g. look for "Aminophenol, Para," not "Para-Aminophenol." Numerical prefixes, such as "Di," "Tri" and "Tetra," are treated as part of the name. The prefix "Mono," is not used: e.g. look for Chlorobenzol, not Monochlorobenzol.

\*Well-known trade names will be found in the index.

All numbers after names refer to the pages of the Catalog where detailed data as to products, facilities for delivery, etc., will be found stated. Where no page numbers are given, firms have not taken space to supply this fuller information, but have merely been listed to give the inquirer a more complete reference work. Depending solely on information furnished us by the firms themselves, the name of an important manufacturer of a given commodity may occasionally have been omitted. We believe, however, that these omissions are few in number and will be more than made up for by the greater accuracy of data possible only through this policy.

There are three particular points on which we would appreciate the suggestions of our readers:—

(1) Headings not at present found in this index which should be there

(2) Additional important firms who should be found under headings under which some firms are already listed.

(3) Firms listed under wrong headings, and other inaccuracies which may have crept into this index in spite of all precautions.

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Pa. Alcohol & Chem. Co., Phila  
Resley Lumber Co., Walton, N. Y.  
Rieffer & Sons, Honesdale, Pa.  
Russell Chem. Co., Russell, Pa.  
Shelby Chem. Co., Shelby, Ala.  
Sligo Furnace Co., St. Louis  
Smethport Wood Prod. Co., Olean, N. Y.  
Smith, A. B. Chem. Co., Buffalo  
Squibb, E. R. & Sons, New York  
Standard Chem. Co., Toronto  
Starucca Chem. Co., Starucca, Pa.  
Straight Creek Chem. Co., Olean, N. Y.  
Sullivan Chem. Co., Acidalia, N. Y.  
Susquehanna Chem. Co., Straight, Pa.  
Thayer, Martin & Son, Boston  
Thonesta Valley Chem. Co., Mavburg, Pa.  
Trep, G. H. & Co., Binghamton, N. Y.  
Treys, George L., Cook Falls, N. Y.  
Tupper Lake Chem. Co., Tupper Lake, N. Y.  
Tyler Hall Chem. Co., Hancock, N. Y.  
Vandalia Chem. Co., Vandalia, N. Y.  
Webb, A. L. & Sons, Baltimore  
Webb, Jas. A. & Son, New York  
Wisconsin Chem. Co., Phelps, Wis.  
Wright Chem. Co., Susquehanna, Pa.  
Wyman Chem. Co., Port Allegany, Pa.  
Wyoming Chem. Co., Pittston, Pa.

ALCOHOL, METHYL, REFINED  
Cooper, Chas. & Co., New York  
Daigger, A. & Co., Chicago  
Harshaw Fuller & Goodwin Co., Cleveland  
Powers - Weightman - Rosen Garten Co., Philadelphia  
Roessler & Haselacher Chemical Co., New York  
U. S. Industrial Alcohol Co., New York  
U. S. Industrial Chemical Co., New York  
Will Corporation, Rochester, N. Y.  
Berry Brothers, Detroit  
Cleveland-Cliffs Iron Co., Cleveland  
Delta Chem. Co., Escanaba, Mich.  
Drackett, P. W. & Sons Co., Cincinnati  
Florida Wood Prod. Co., Jacksonville, Fla.  
Gray, Wm. S. & Co., New York  
Kerry, Thos., Co., Hancock, N. Y.  
Melville Corbett Co., St. Marys, Pa.  
Michigan Iron & Chem. Co., Chicago  
Rogers & McClellan, Boston  
Sargent, Chas. A., Co., Cleveland

ALCOHOL, METHYL, REFINED—  
Con.  
Seaboard Chem. Co., Newark, N. J.  
Standard Chemical Co., Toronto  
Wood Prod. Co., Buffalo  
Wyoming Chem. Co., Wilkes-Barre, Pa.

ALCOHOL, METHYL, PLANTS  
Badger, E. B. & Sons Co., Boston  
Corbett, Geo. E., Boller & Tank Co., Chicago  
Detroit Heating & Lighting Co., Detroit  
Groen Mfg. Co., Chicago  
Kopperman, Joseph & Sons, Philadelphia  
Koven, L. O. & Brother, Jersey City, N. J.  
Lummus, Walter E., Co., Boston  
Oakland Copper & Brass Works, Oakland, Cal.  
Oat, Joseph & Sons, Philadelphia  
Ott, George F., Co., Philadelphia  
Roos, Chas. A., Inc., New York  
Struthers-Wells Co., Warren, Pa.  
Vendome Copper and Brass Works, Louisville, Ky.  
Welded Steel Barrel Corp., Detroit

ALCOHOL, MEROL  
Van Dyk & Co., New York

ALCOHOL, NONYL  
Van Dyk & Co., New York

ALCOHOL, OCTYL  
Synthetical Laboratories of Chicago, Chicago  
Van Dyk & Co., New York

ALCOHOL, PHENYLETHYL  
Dow Chemical Company, Midland, Mich.  
Rhodia Chemical Company, New York  
Ising, C. E., Corp., Flushing, N. Y.  
Orbis Prod. Trading Co., New York

ALCOHOL, RECOVERY APPARATUS  
Badger, E. B. & Sons Co., Boston  
Corbett, Geo. E., Boller & Tank Co., Chicago  
Detroit Heating & Lighting Co., Detroit  
Glander & Company, Newark, N. J.  
Groen Mfg. Co., Chicago  
Kopperman, Joseph & Sons, Philadelphia  
Lummus, Walter E., Co., Boston  
Oakland Copper & Brass Works, Oakland, Cal.  
Roos, Chas. A., Inc., New York  
Scott, Ernest & Co., Fall River, Mass.  
Stokes, F. J., Machine Co., Philadelphia  
Vendome Copper & Brass Works, Louisville, Ky.  
Welded Steel Barrel Corp., Detroit

ALCOHOL, PHENYLPROPYL  
Van Dyk & Co., New York

ALCOHOL, PROPYL  
LaMotte Chemical Products Co., Baltimore  
U. S. Industrial Chemical Co., New York  
Standard Oil Co. of N. J., New York

ALCOHOL, "PYRO"  
U. S. Industrial Alcohol Co., New York

ALCOHOL, STYROL  
Van Dyk & Co., New York

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Cladin, Geo. L., Co., Providence  
Daigger, A. & Co., Chicago  
Elmer & Amend, New York  
Glass Specialty Co., Newark, N. J.  
Griebel Instrument Co., Inc., Carbondale, Pa.  
Hergesell Brothers, Philadelphia  
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Ising, C. E. Corporation, Flushing, N. Y.		Ulro Chem. Co., New York		<b>ALKALI BLUE L</b>	
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Parcell, C. C. Co., Chicago		Robinson Bros., Bklyn		<b>AMMONIA SALTS</b>	
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<b>AMMONIUM FERRIC OXALATE</b>		American Cyanamid Co., New York	1089	Western Gas Const. Co., Ft. Wayne, Ind.	
Dissosway Chem. Co., Bklyn.		Chaplain & Bibbo, New York	1106	<b>AMMONIUM SULFIDE</b>	
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Hachmeister - Lind Chem. Co., Pittsburgh		Baker, J. T., Chemical Co., Phillipsburg, N. J.	1095	Baker, J. T., Chemical Co., Phillipsburg, N. J.	10
Ward, John C. & Co., Bklyn.		<b>AMMONIUM PHOSPHATE, MONO-BASIC</b>		<b>AMMONIUM SULFOCARBOLATE</b>	
<b>AMMONIUM FLUORIDE, C. P. "BAKER'S ANALYZED"</b>		American Cyanamid Co., New York	1089	Albany Chemical Company, Albany, N. Y.	10
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<b>AMMONIUM HYDRATE. See Ammonia, Aqua</b>		Heyden Chemical Co., Garfield, N. J.	1131	Will Corporation, Rochester, N. Y.	972-10
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**AMYL FORMATE**  
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Toledo Steel Barrel Co., Toledo, Ohio		Sargent, Chas. R., Co., Cleveland		Daigger, A. & Co., Chicago	428
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Wilson & Bennett Mfg. Co., Chicago		Stresen-Reuter & Biser, Chicago		Glass Specialty Co., Newark, N. J.	523
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Hoffmann, Anton, Inc., New York	566	Heller & Merz Co., New York	1128	Alberene Stone Company, New York	258-259
Koven, L. O. & Brother, Jersey City, N. J.	651	Caleo Chem. Co., Bound Brook, N. J.		Brooklyn Thermometer Co., Brooklyn, N. Y.	368
Mayer Tank Mfg. Co., Brooklyn, N. Y.	694	BASIC BLUE		Claffin, Geo. L., Co., Providence, R. I.	405
BARRELS, WOODEN		Heller & Merz Co., New York	1128	Elmer & Amend, New York	457
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Atlantic Tank & Barrel Corp., Hoboken, N. J.	302	Dicks, David Co., New York		Marshall Eleha, Inc., Baltimore	692
Hoffmann, Anton, Inc., New York	566	Frost, F. W. & Co., New York		Mine & Smelter Supply Co., New York	704-705
International Cooperage Co., Inc., Niagara Falls, N. Y.	589	BASIC BROWN		Palo Company, New York	749
Mayer Tank Mfg. Co., Brooklyn, N. Y.	694	Dicks, David Co., New York		Rovey Instrument & Chemical Co., Buffalo	814
Moore, Lucas, Stave Co., New York	708	BASIC DYE STUFFS "DU PONT"		Standard Scientific Co., New York	852
O'Malley's, Cooperage, Inc., Brooklyn, N. Y.	734	Du Pont de Nemours, E. I. & Co., Wilmington, Del.	1116-1118	Will Corporation, Rochester, N. Y.	972-1066
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BARS, BRASS, BRONZE & COPPER		Heller & Merz Co., New York	1128	Elmer & Amend, New York	457
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BARRELS, LEAD		Acid Proof Clay Products Company, Akron, O.	248	Mine & Smelter Supply Co., New York	704-705
Andrews Lead Company, Long Island City, N. Y.	287	General Ceramics Company, New York	504-507	Palo Company, New York	749
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United Lead Co., New York	911-915	Multi Metal Co., New York	714	Scientific Utilities Co., New York	826-827
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		Ott, George F., Co., Philadelphia	714	Claffin, Geo. L., Co., Providence, R. I.	405
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		BASKETS, DIPPING, ACID PROOF		Glass Specialty Co., Newark, N. J.	523
		Acid Proof Clay Products Co., Akron, O.	248	Marshall Eleha, Inc., Baltimore	692
		General Ceramics Company, New York	504-507	Mine & Smelter Supply Co., New York	704-705
		Knight, Maurice A., East Akron, Ohio	638-649	Palo Company, New York	749
		Multi Metal Co., New York	714	Rovey Instrument & Chemical Co., Buffalo	814
		BASKETS, PICKLING, ACID-PROOF		Scientific Utilities Co., Inc., New York	826-827
		Acid Proof Clay Products Co., Akron, O.	248	Standard Scientific Co., New York	852
		General Ceramics Company, New York	504-507	Will Corporation, Rochester, N. Y.	972-1066

The Symbol "®" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12



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Kopperman, Joseph & Sons, Philadelphia	650	<b>BEAMS, COTTON</b>	473	Simpson, Orville, Co., Cincinnati	835
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U. S. & Cuban Allied Works Engineering Corp., New York	920	<b>BEARINGS, BABBITT METAL</b>	351	<b>BELTING, ACID RESISTING</b>	
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<b>BATTERIES, STORAGE</b>		Easton Car & Construction Co., Easton, Pa.	154-155	<b>BELTING, CAMEL'S HAIR</b>	
Fairbanks, Morse & Co., Chicago	473	Hart Roller Bearing Co., Orange, N. J.	547	Rossendale-Roadway Belting & Hose Co., Newark, N. J.	
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<b>BATTERY CHARGING EQUIPMENT</b>		<b>BEARINGS, JOURNAL, ANTI-FRICTION</b>	547	<b>BELTING, CANVAS</b>	
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		Hart Roller Bearing Co., Orange, N. J.	547	Weller Manufacturing Co., Chicago	941
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<b>BATTERY MANGANESE. See Manganese Dioxide</b>		Latimer, Robert L. & Co., Philadelphia	661	Manhattan Rubber Mfg. Co., Passaic, N. J.	690
<b>BATTERY SOLUTIONS</b>		<b>BEARINGS, ROLLER, THRUST</b>	547	<b>BELTING, CONVEYOR</b>	
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Lavino, E. J. & Co., Phila.		<b>BEATERS, PAPER MILL</b>		<b>BELTING, COTTON. See Belting, Canvas</b>	
<b>BEAKERS, DYE POTS</b>		Chadwick Co., Lancaster, O.		<b>BELTING, ELEVATOR. See Belting, Conveyor</b>	
Coors Porcelain Co., Golden, Colo.	414-415	Ditts Mach. Wks., Fulton, N. Y.		<b>BELTING, FLEXIBLE SPIRAL</b>	
Will Corporation, Rochester, N. Y.	972-1066	Downingtwn Mfg. Co., Downingtown, Pa.		Estey Wire Works Co., New York	470-471
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Brooklyn Thermometer Co., Brooklyn, N. Y.	368	Holyoke Mach. Co., Holyoke, Mass.		<b>BELTING, IRON WIRE</b>	
Cladlin, Geo. L., Co., Providence, R. I.	405	Jones, E. D. & Sons Co., Pittsfield, Mass.		Estey Wire Works Co., New York	470-471
Corning Glass Works, Corning, N. Y.	418	McKim Edry & Mach. Co., Lockport, N. Y.		Wickwire Spencer Steel Corp., Worcester, Mass.	970-971
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**CADMIUM NITRATE, C. P. "BAKER'S ANALYZED"**  
 Baker, J. T., Chemical Co., Phillipsburg, N. J. 1095

**CADMIUM-POTASSIUM IODIDE**  
 Powers - Weightman - Rosengarten Co., Philadelphia 1172  
 Squibb, E. R., & Sons, New York

**CADMIUM SALTS.** See specific heads

**CADMIUM SULFATE**  
 Cooper, Chas., & Co., New York 1111  
 Grasselli Chemical Co., Cleveland 1125  
 Powers - Weightman - Rosengarten Co., Philadelphia 1172  
 Will Corporation, Rochester, N. Y. 972-1066  
 Dissosway Chem. Co., Brooklyn, N. Y.  
 Merck & Co., New York

**CADMIUM SULFATE, C. P. "BAKER'S ANALYZED"**  
 Baker, J. T., Chemical Co., Phillipsburg, N. J. 1095

**CADMIUM SULFIDE**  
 Cooper, Chas., & Co., New York 1111  
 Daigger, A., & Co., Chicago 428  
 Drakenfeld, B. F., & Co., Inc., New York 1115  
 Grasselli Chemical Co., Cleveland 1125  
 Harshaw Fuller & Goodwin Co., Cleveland 1127  
 Hummel & Robinson Corp., New York 1135  
 Powers - Weightman - Rosengarten Co., Philadelphia 1172  
 Siegle, G. Corp., of America, Rosebank, S. I., N. Y. 1185  
 Waldo, E. M. & F., New York 1208  
 Amer. Smelt & Ref. Co., New York  
 Foote Mineral Co., Phila.  
 Genl. Metallic Oxides Co., Jersey City  
 Krebs Pigments & Chem. Co., New York  
 Merck & Co., New York  
 Midland Chem. Co., Chicago  
 Rockhill & Victor, New York  
 Sargent, Chas. R. Co., Cleveland  
 Stresen-Reuter & Biser, Inc., Chicago  
 Warda, John C. & Co., Bklyn.

**CADMIUM TRISALYT**  
 Boessler & Hasselacher Chemical Co., New York 1178-1179

**CADMIUM TUNGSTATE**  
 Powers - Weightman - Rosengarten Co., Philadelphia 1172

**CAFFEINE AND ITS SALTS**  
 Albany Chemical Company, Albany, N. Y. 1087  
 Boessler & Hasselacher Chemical Co., New York 1178-1179  
 Abbott Labs., Chicago  
 Chemical Wks. of Amer., Stamford, Conn.

**CAFFEINE AND ITS SALTS—Con**  
 Greoff, R. W., & Co., New York  
 Hoffman-La Roche Chem. Wks., New York  
 Kaffee Hag Corp., Cleveland  
 Leeds Chem. Co., Kansas City  
 Merck & Co., New York  
 Monsanto Chem. Wks., St. Louis  
 Seydel Mfg. Co., Jersey City  
 Stearns, Fred., & Co., Detroit

**CAGE MILLS.** See Mills, Cage

**CAGES, WIRE**  
 Audubon Wire Cloth Co., Audubon, N. J. 308

**CAISSONS**  
 Buffalo Foundry & Machine Co., Buffalo 374-379  
 Chicago Bridge & Iron Works, Chicago 399  
 Coatesville Boiler Works, Coatesville, Pa. 408  
 Koven, L. O., & Brother, Jersey City, N. J. 651  
 Newbold, E. E., & Sons Co., Northtown, Pa. 722  
 Tippet & Wood, Phillipsburg, N. J. 891

**"CALAFENE" PIGMENT BINDER**  
 Apex Chemical Co., Inc., New York 1094

**CALAMINE**  
 Powers - Weightman - Rosengarten Co., Philadelphia 1172

**CALANDRIAS.** See Evaporators

**CALCINERS**  
 Christie, L. E., Company, Pittsburgh 404  
 Ruggles-Coles Engineering Co., New York 818  
 Dunning-Lueckel Eng. Co., New York

**CALCINERS, DUSTLESS**  
 Christie, L. E., Company, Pittsburgh 404

**CALCINERS, ROTARY**  
 Christie, L. E., Company, Pittsburgh 404

**CALCINING PROCESSES**  
 Schaffer Engineering & Equipment Co., Pittsburgh 821

**CALCITE**  
 National Sales Co., Cincinnati 1161

**CALCITONE**  
 U. S. Industrial Alcohol Co., New York 1200-1203

**CALCIUM ACETATE**  
 Cooper, Chas., & Co., New York 1111  
 Harshaw Fuller & Goodwin Co., Cleveland 1127  
 Miner Edgar Company, New York 1156  
 U. S. Industrial Alcohol Co., New York 1200-1203

Antrim Iron Co., Grand Rapids  
 Bartley, John, Mt. Alton, Pa.  
 Beersden Acetate Co., Olean, N. Y.  
 Berry Bros., Detroit  
 Bon Air Coal & Iron Co., Lyles, Tenn.  
 Boyne City Chem. Co., Boyne City, Mich.  
 Buckhannon Chem. Co., Olean, N. Y.  
 Cadillac Chem. Co., Cadillac, Mich.  
 Charcoal Iron Co., Detroit  
 Chatham Mfg. Co., Savannah  
 Clawson Chem. Co., Halliton, Pa.  
 Collier, W. C., & Sons, Binghamton, N. Y.  
 Corbett, M. J., & Co., St. Marys, Pa.  
 Corbett & Stuart, Corbett, N. Y.  
 Coryville Chem. Co., Coryville, N. Y.  
 Crossley Chem. Co., Bklyn.  
 Cummer-Diggins Co., Cadillac, Mich.  
 Custer City Chem. Co., Custer City, Pa.  
 Day Chem. Co., Westline, Pa.  
 Delta Chem. Co., Escanaba, Mich.  
 Desmond Charcoal & Chem. Co., Detroit  
 Duck Harbor Lumb. & Chem. Co., Lookout, Pa.  
 E. Jordan Chem. Co., E. Jordan, Mich.  
 Forest Chem. Co., Sheffield, Pa.  
 Forest Prod. Chem. Co., Memphis  
 Gaffney Wood Prod. Co., Walton, Pa.  
 Genesee Chem. Co., Genesee, Pa.  
 Gray, Wm. S., & Co., New York

Mentioning this catalog when writing firms enables us to give you a better reference work next year.  
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CALCIUM ACETATE—Con.		CALCIUM BROMIDE		CALCIUM CARBONATE, CRUDE (LIMESTONE)—Con.	
Grayling Wood Prod. Co., Grayling, Mich.		Dow Chemical Co., Midland, Mich.	1114	Pittsfield Lime & Stone Co., New York	
Greoff, R. W. & Co., New York		Powers-Weightman-Rosengarten Co., Philadelphia	1172	Rockfield Prod. Co., Milwaukee	
Heilmann Chem. Co., Olean, N. Y.		Will Corporation, Rochester, N. Y.	972-1066	Rockland & Rockport Lime Co., Rockland, Me.	
Hodgson Bros. Chem. Co., Lindsay, Ont.				Sheboygan Lime Wks., Sheboygan, Wis.	
Industrial Dist. Co., Waterloo, N. Y.		<b>CALCIUM BROMIDE, C. P. "BAKER'S ANALYZED"</b>		Standard Chem. Co., Toronto	
James Mfg. Co., Kane, Pa.		Baker, J. T., Chemical Co., Phillipsburg, N. J.	1095	Standard Lime & Stone Co., Fond du Lac, Wis.	
Kerry, Thos. Co., Hancock, N. Y.		<b>CALCIUM CARBIDE</b>		Warner, Chas. Co., Phila.	
Kentucky Wood Prod. Co., Krugers, Ky.		Canada Carbide Co., Ltd., Montreal	1104	Whiterock Quarries, Bellefonte, Pa.	
Kinzu Valley Chem. Co., Williamsport, Pa.		International Oxygen Co., Newark, N. J.	597		
Lacka Chem. Co., Olean, N. Y.		Air Reduction Sales Co., New York		<b>CALCIUM CHLORIDE</b>	
Lamont Chem. Co., Kane, Pa.		Natl. Carbide Corp., Branwell, W. Va.		Cooper, Chas., & Co., New York	1111
Leighton, Arthur, Co., Cook's Falls, N. Y.		Union Carbide Co., New York		Dow Chemical Co., Midland, Mich.	1114
Leighton & Co., Methol, N. Y.		Union Carbide Co., Welland, Ont.		Grassell Chemical Co., Cleveland	1125
Lewis Run Mfg. Co., Bradford, Pa.		Wilson Carbide Co., St. Catharines, Ont.		Harshaw Fuller & Goodwin Co., Cleveland	1127
Liberty Wood Prod. Co., Port Allegany, Pa.		<b>CALCIUM CARBONATE</b>		Kilpstein, A. & Co., New York	1113
Luzerne Chem. Co., Pittston, Pa.		Note: The following are firms handling powdered calcium carbonate of a high degree of purity for manufacturing and experimental purposes. If in need of calcium carbonate in bulk (limestone) consult the list under "Calcium carbonate, crude"		Marshall Richa, Inc., Baltimore	692
McKean Chem. Co., Williamsport, Pa.		Cooper, Chas., & Co., New York	1111	Mathieson Alkali Works, New York	1152
Maplewood Chem. Co., Shillington, N. Y.		Harshaw Fuller & Goodwin Co., Cleveland	1127	National Sales Co., Cincinnati	1161
Maryvale Chem. Co., Marysville, Pa.		Kilpstein, A. & Co., New York	1113	Powers-Weightman-Rosengarten Co., Philadelphia	1172
Maryland Wood Prod. Co., Maryland, N. Y.		National Sales Co., Cincinnati	1161	Roesler & Hasselacher Chemical Co., New York	1178-1179
Michigan Iron & Chem. Co., Chicago		Security Cement & Lime Co., Hagerstown, Md.	1180	Solvay Process Company, Syracuse, N. Y.	1186-1189
Mid-Continental Iron Co., Kansas City		Will Corporation, Rochester, N. Y.	972-1066	Will Corporation, Rochester, N. Y.	972-1066
Milwaukee Chem. Co., Milwaukee, Pa.		Can. Salt Co., Windsor, Ont.		Amet Calcium Chloride Wks., Hartford, W. Va.	
Miss Wood Prod. Co., Charleston, Miss.		Hochmeister-Lind Chem. Co., Pittsburgh		Baker, H. J. & Bro., New York	
Mt. Hope Chem. Charcoal Wks., Mt. Hope, Pa.		Mt. Joy Magnesia Co., Mt. Joy, Pa.		Bush, Beach & Gent, New York	
Nansen Chem. Co., Nansen, Pa.		Merek & Co., New York		Columbia Chem. Div., Pittsburgh	
Natl. Chem. Co., Bradford, Pa.		Product Sales Co., Baltimore		Drackett, P. W. & Sons Co., Cincinnati	
Oregon Wood Dist. Co., Portland, Ore.		Squibb, E. R. & Sons, New York		Fishman Salt Prod. Co., Saginaw, Mich.	
Otto Chem. Co., Williamsport, Pa.		Valley Marl & Lime Corp., Roanoke, Va.		Great Western Electrochem. Co., San Fran.	
Penn. Chem. Co., Ridgeway, Pa.		Vanderbilt, R. T. Co., New York		Greoff, R. W. & Co., New York	
Pierce & Stevens, Buffalo		Whittaker, Clark & Daniels, New York		Hill, A. W., Chem. Co., Los Angeles	
Rieffer & Sons, Honesdale, Pa.		<b>CALCIUM CARBONATE, C. P. "BAKER'S ANALYZED"</b>		Rockhill & Victor, New York	
Risley Lum. Co., Walton, N. Y.		Baker, J. T., Chemical Co., Phillipsburg, N. J.	1095	Saginaw Chem. Co., Saginaw, Mich.	
Russell Chem. Co., Russell, Pa.		<b>CALCIUM CARBONATE (ICELAND SPAR), "BAKER'S"</b>		Saydel Mfg. Co., Jersey City	
Shelby Chem. Co., Shelby, Ala.		Baker, J. T., Chemical Co., Phillipsburg, N. J.	1095	Stauffer Chem. Co., San Fran.	
Smith, J. B., Chemical Co., Buffalo		<b>CALCIUM CARBONATE, CRUDE (LIMESTONE)</b>		Stuesch, Reiter & Biser, Chicago	
Standard Chem. Co., Toronto		Mitchell Lime Co., Chicago, Ill.	1157	Whittaker, Clark & Daniels, New York	
Starucca Chem. Co., Starucca, Pa.		Palmer Lime & Cement Co., New York	1167		
Strait Creek Chem. Co., Olean, N. Y.		Pearless White Lime Co., St. Louis	1168	<b>CALCIUM CHLORIDE, C. P. "BAKER'S ANALYZED"</b>	
Sullivan Chem. Co., Acidalia, N. Y.		Security Cement & Lime Co., Hagerstown, Md.	1180	Baker, J. T., Chemical Co., Phillipsburg, N. J.	1095
Trepp, G. H. & Co., Binghamton, N. Y.		Solvay Process Company, Syracuse, N. Y.	1186-1189	<b>CALCIUM CHLORIDE PLANTS</b>	
Treys, George I., Cook Falls, N. Y.		Akric & Coml. Lime Co., Canton, O.		Cannon-Swenson Co., Chicago	384-385
Tupper Lake Chem. Co., Smithport, Pa.		Allwood Lime Co., Chicago		Ferry & Webster, Inc., New York	760-761
Tyler-Hall Chem. Co., Hancock, N. Y.		Arrowhead Mfg. Co., St. Louis		<b>CALCIUM CITRATE</b>	
Tyler-Hall Chem. Co., Roadburn, N. Y.		Atlas Mineral Prod. Co., Lincoln, N. J.		Cult. Citrus By-Products Co., Anaheim, Cal.	
Wisconsin Chem. Co., Phelps, Wis.		Austin White Lime Co., Austin, Tex.		<b>CALCIUM CYANAMIDE. See "Cyanamid"</b>	
Wood Prod. Co., Buffalo		Black White Lime Co., Quincy, Ill.		<b>CALCIUM FERROCYANIDE</b>	
Wright Chem. Co., Ridgeway, Pa.		Bushy & Son, G. M., Cavetown, Md.		Bower, Henry, Chem. Mfg. Co., Phila.	
Wyman Chem. Co., Port Allegany, Pa.		Can. Chem. Prod. Co., Montreal		<b>CALCIUM FLUORIDE</b>	
		Canyon Lime Co., Hot Springs, N. M.		Will Corporation, Rochester, N. Y.	972-1066
<b>CALCIUM ACETATE, C. P. "BAKER'S ANALYZED"</b>		Chazy Marble Lime Co., Chazy, N. Y.		Foot Mineral Co., Phila.	
Baker, J. T., Chemical Co., Phillipsburg, N. J.	1095	Chem. Lime Co., Bellefonte, Pa.		Warda, John C. & Co., Bklyn	
<b>CALCIUM ACETATE PLANTS. See Wood Distillation Equipment</b>		Cheney Lime Co., Allgood, Ala.		<b>CALCIUM FLUORIDE, C. P. "BAKER'S ANALYZED"</b>	
<b>CALCIUM ARSENATE</b>		Courchesne, A., El Paso, Tex.		Baker, J. T., Chemical Co., Phillipsburg, N. J.	1095
Chipman Chemical Engineering Co., Inc., New York	1107	Dewey Portland Cement Co., Kansas City		<b>CALCIUM FLUOSILICATE. See Calcium Silicofluoride</b>	
Dow Chemical Co., Midland, Mich.	1114	Glencoe Lime & Cement Co., St. Louis		<b>CALCIUM FORMATE</b>	
Will Corporation, Rochester, N. Y.	972-1066	Grove, M. J., Lime Co., Lime Kiln, Md.		Trojan Powder Co., Allentown, Pa.	
Acme Labs., Toronto		Hoosac Valley Lime Co., Adams, Mass.		<b>CALCIUM GLYCEROPHOSPHATE</b>	
Ansbacher, A. B. & Co., New York		Independent Lime & Stone Co., Drucker, Wis.		Kilpstein, A. & Co., New York	1143
Cowan, John, Chem. Co., Montreal		Indus. Limestone Co., Bethlehem, Pa.		Merek & Co., New York	
Nitrate Agencies Co., New York		Leesburg Lime Co., Leesburg, Va.		Monsanto Chem. Wks., St. Louis	
<b>CALCIUM ARSENATE, C. P. "BAKER'S ANALYZED"</b>		Mayville White Lime Wks., Mayville, Wis.		<b>CALCIUM HYDRATE. See Calcium Hydroxide</b>	
Baker, J. T., Chemical Co., Phillipsburg, N. J.	1095	Michigan Limestone & Chem. Co., Rogers City, Mich.		<b>CALCIUM HYDROXIDE</b>	
<b>CALCIUM ARSENITE</b>		Northern Lime & Stone Co., Petoskey, Mich.		Dalger, A. & Co., Chicago	428
Chipman Chemical Engineering Co., Inc., New York	1107	Ontario Limestone & Clay Co., Belleville, Ont.		Mitchell Lime Co., Chicago	1157
<b>CALCIUM BISULFITE</b>		Pittsburgh Plate Glass Co., Berton, O.		Palmer Lime & Cement Co., New York	1167
Cooper, Chas., & Co., New York	1111			Pearless White Lime Co., St. Louis	1168
Cowan, John, Chem. Co., Montreal				Security Cement & Lime Co., Hagerstown, Md.	1180

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### CALCIUM SULFATE

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Disposway Chem. Co., Bklyn		STEAM—Con		Pneumatic Scale Corp., Norfolk	
Fishack Gypsum Co., Toledo, O		Marshall Nieha, Inc., Baltimore...		Downs, Mass. ....770-771	
Garbett Gypsum Co., Rochester, N Y		Palo Company, New York.....		Burt Mach. Co., Balto.	
Hachmetter - Lind Chem. Co., Pittsburgh		Precision Instrument Co., Newark, N. J. ....782-783		Economic Mach. Co., Worcester, Mass.	
Hitt Bruff Chem. Co., Hoopston, Ill		Rovay Instrument & Chemical Co., Buffalo		Jagenberg Mach. Co., New York	
Independence Gypsum Co., Enid, Okla		Sarco Company, New York.....		CANNING MACHINERY	
Keystone Plaster Co., Chester, Pa		Schaeffer & Budenberg Mfg. Co., Brooklyn, N Y		Elyria Enameled Products Co., Elyria, O	
Lycoming Calcining Co., Garbutt, N Y		Scientific Utilities Co., Inc., New York		Pfandler Company, Rochester....	
Mepharm & Co., Geo. S. E. St. Louis, Ill		Smith Gas Engineering Co., Dayton, O		CANS	
Merck & Co., New York		Standard Calorimeter Co., East Moline, Ill		Fidelity Can Company, Baltimore..	
Nevada Gypsum Co., San Fran		Standard Scientific Co., New York		Amer. Can Co., New York	
Niagara Gypsum Co., Buffalo		Will Corporation, Rochester, N Y		Continental Can Co., Syracuse	
Oakka Gypsum, Rochester, N Y		CALORIMETERS, "CARPENTER'S" SEPARATING AND THROTTLING STEAM		J. S. Giles & Sons, Chicago	
Pacific Coast Gypsum, Tacoma		Schaeffer & Budenberg Mfg. Co., Brooklyn, N Y		Heekin Can Co., Cincinnati	
Plymouth Gypsum Co., Ft. Dodge, Ia.		CALORIMETERS, GAS, RECORDING		Republic Can & Metal Co., Bklyn.	
S. Gypsum Co., North Holston, Va		Smith Gas Engineering Co., Dayton, O		Southern Can Co., Balto.	
Stroven-Reuter & Biser, Chicago		Cutler-Hammer Mfg. Co., Milwaukee		CANS, FIBER	
W. Gypsum Co., San Francisco		CALORIMETERS, "FARE"		St. Louis Paper Can & Tube Co., St. Louis	
W. Paper Makers Chem. Co., Kalamazoo		Standard Calorimeter Co., East Moline, Ill		CANS, STORAGE	
Whittaker, Clark & Daniels, New York		CALORIMETERS, SPECIAL		Stewart & Peterson Company, Burlington, N. J.	
Whittaker Co., W. H., New York		Emerson Apparatus Co., Melrose, Mass.		CANS, TIN, DECORATED	
Williams & Co., C. K., Easton, Pa.		Standard Calorimeter Co., East Moline, Ill		Fidelity Can Company, Baltimore.	
CALCIUM SULFATE, C. P. "BAKER'S ANALYZED"		CALORIZING OF METALS		CANS, TIN, FRICTION TOP	
Baker, J. T., Chemical Co., Philadelphia, N. J.		General Electric Co., Schenectady, N Y		Fidelity Can Company, Baltimore.	
CALCIUM SULFIDE		CALOTTES		CANS, TIN, JACKET	
Will Corporation, Rochester, N Y		Duriron Company, Dayton, O		Fidelity Can Company, Baltimore.	
Merck & Co., New York		CAMERAS, PHOTOMICROGRAPHIC		CANS, TIN, PACKERS' SANITARY	
CALCIUM SULFIDE, C. P. "BAKER'S"		Bausch & Lomb Optical Co., Rochester, N Y		Fidelity Can Company, Baltimore.	
Baker, J. T., Chemical Co., Philadelphia, N. J.		Will Corporation, Rochester, N Y		CANS, TIN, SCREW TOP	
CALCIUM SULFITE		CAMERAS, SCIENTIFIC		Fidelity Can Company, Baltimore.	
Mann & H. Chem. Co., Los Angeles		Bausch & Lomb Optical Co., Rochester, N Y		CANS, TIN, SQUARE, 5 GALLON	
Rumford Chemical Works, Providence, R. I.		Elmer & Amend, New York		Fidelity Can Company, Baltimore.	
CALCIUM SULFOCARBOLATE		Will Corporation, Rochester, N Y		CANS, TIN, SQUARE OR ROUND	
Albany Chemical Company, Albany, N Y		"CAMERON" CENTRIFUGALS AND PUMPS		Fidelity Can Company, Baltimore.	
Merck & Co., New York		Ingersoll-Rand Co., New York		CANS, TIN, WAX TOP	
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Textile Finishing Machinery Co., Providence		Nagase, D. & Co., New York		Robertson, H. E. Company, Pittsburgh	
Birmingham Iron Edry., Derby, Conn		Rockhill & Victor, New York		CAPSULE FILLING MACHINES	
CALENDARS, EMBOSSEING		Sargent, Chas. R. Co., Cleveland		Colton, Arthur, Company, Detroit.	
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Textile Finishing Machinery Co., Providence		Stroven-Reuter & Biser, Chicago		Coors Porcelain Co., Golden, Colo	
Curtis & Marble Mach. Co., Worcester, Mass		CAMS, SPLIT, FOR FLAT SCREENS		Norton Company, Worcester, Mass.	
Polyoke Mach. Works, Holyoke, Mass		Glens Falls Mach. Wks., Glens Falls, N Y		Thermal Syndicate, Ltd., New York	
Lohdell Car Wheel Co., Wilmington		CAMPHOR MONOBROMATE		Will Corporation, Rochester, N Y	
McKim Edry & Mach. Co., Lockport, N. Y		Dow Chemical Co., Midland, Mich		CAR LOADERS, PNEUMATIC	
Ticonderoga Mach. Wks., Ticonderoga, N. Y.		Dickinson, J. G. & Co., Malden, W. Va		Guarantee Construction Co., New York	
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Brooklyn Thermometer Co., Brooklyn, N. Y.		Hottman Machine Co., Philadelphia		CARAMEL	
Claffin, Geo. L., Co., Providence, R. I.		Vilter Manufacturing Company, Milwaukee		Bush, W. J., & Co., Inc., New York	
Dalger, A. & Co., Chicago		Waring, O. I., Filling Machine Co., New York		Fries & Fries Co., Cincinnati....	
Elmer & Amend, New York		Automatic Weighing Machine Co., Newark, N. J.		Dehls & Stein, Newark, N. J.	
Emerson Apparatus Co., Melrose, Mass.		Mechanical Mfg. Co., Chicago		Henderson, Thomas, & Co., New York	
Glass Specialty Co., Newark, N. J.		CAN HANDLING MACHINERY		Williamson, D. D. & Co., New York	
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				CARBOLON	
				Exolon Co., Cambridge, Mass.	
				CARBON BISULFIDE	
				Brown Company, Portland, Me....	
				Cooper, Chas., & Co., New York...	
				Dalger, A. & Co., Chicago	

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CELLULOSE SOLUTIONS, SPECIAL		Atlas Mineral Prod. Co., Merz- town, Pa.		Standard Portland Cement Co., San Fran.	
Du Pont de Nemours, E. I., & Co., Inc., Wilmington 1116-1118		Carey, Philip, Co., Lockland, O. Denver Fire Clay Co., Denver		Tidewater Portland Cement Co., Baltimore	
Chem. Prod. Co., Cambridge, Mass. Maas & Waldstein Co., Newark, N. J.		Dixon, Jos., Crucible Co., Jersey City		Universal Portland Cement Co., Chicago	
Van Schanck Bros. Chem. Wks., Chicago		Foot Mineral Co., Phila. Stowe Fuller Co., Cleveland		U. S. Portland Cement Co., Kan- sas City, Mo.	
CEMENT, ACID-PROOF		CEMENT, "FURNASEAL"		Vulcanite Portland Cement Co., Phila.	
Barber Asphalt Paving Co., Phila- delphia 1098		Laclede-Christy Clay Products Co., St. Louis 654		CEMENT, "REDMANOL"	
Electro-Chemical Supply & Eng. Co., Philadelphia 460		CEMENT, GAS RETORT PATCHING		Redmanol Chemical Products Co., Chicago 800	
Marshall Richa, Inc., Baltimore 692		Laclede-Christy Clay Products Co., St. Louis 654		CEMENT, REFRACTORY	
Robertson, H. H., Company, Pitts- burgh 806-808		CEMENT, HIGH TEMPERATURE		Barber Asphalt Paving Co., Phila- delphia 1098	
Wallis Dove - Hermiston Corp., New York 931		Brooklyn Fire Brick Works, Brook- lyn, N. Y. 367		Brooklyn Fire Brick Works, Brook- lyn, N. Y. 367	
Warren Chemical Division, New York 936		Laclede-Christy Clay Products Co., St. Louis 654		Laclede-Christy Clay Products Co., St. Louis 654	
Will Corporation, Rochester, N. Y. 972-1066		Pyroelectric Instrument Co., Tren- ton, N. J. 790		National Sales Co., Cincinnati 1161	
Amer. Enamelled Brick & Tile Co., New York		Quigley Furnace Specialties Co., New York 791		Norton Company, Worcester, Mass.	
Chem. Const. Co., Charlotte, N. C. Morene Products Co., Inc., New York		Atlas Mineral Prod. Co., Merz- town, Pa.		Pyroelectric Instrument Co., Tren- ton, N. J. 790	
Pecora Paint Co., Phila. Toch Bros., New York		Bird-Archer Co., New York Denver Fire Clay Co., Denver		Warren Chemical Division, New York 936	
CEMENT, ACID-PROOF, "DURO"		Dixon, Jos., Crucible Co., Jersey City		Atlas Mineral Prod. Co., Merz- town, Pa.	
Electro-Chemical Supply & En- gineering Co., Philadelphia 460		Foot Mineral Co., Phila. Gravett, Wm. J., Long Island City, N. Y.		Bour, J. J., Refractories Co., Scranton, Pa.	
CEMENT, ASBESTOS		CEMENT, HIGH TEMPERATURE, "AERNU"		Carborundum Co., Niagara Falls	
Armstrong Cork & Insulation Co., Pittsburgh 295-297		Laclede-Christy Clay Products Co., St. Louis 654		Clinton Metallic Paint Co., Clin- ton, N. Y.	
Belmont Packing & Rubber Co., Philadelphia 346		CEMENT, HIGH TEMPERATURE "FIRE SEAL"		Dixon, Jos., Crucible Co., Jersey City	
Janos Asbestos Co., New York 604		Brooklyn Fire Brick Works, Brook- lyn, N. Y. 367		Foot Mineral Co., Phila. Stowe Fuller Co., Cleveland	
Keasbey & Mattison Co., Ambler, Pa. 619		CEMENT, HIGH TEMPERATURE "VOLCANO"		CEMENT, ROOFING	
Norristown Magnesia & Asbestos Co., Norristown, Pa. 730		Gravett, Wm. J., Long Island City, N. Y.		Barber Asphalt Paving Co., Phila- delphia 1098	
Atlas Mineral Prod. Co., Merz- town, Pa.		CEMENT, "HYTEMPITE"		Warren Chemical Division, New York 936	
Carey, Philip, Co., Lockland, O. Mikessell Brothers Co., Chicago		Quigley Furnace Specialties Co., New York 791		CEMENT, RUBBER	
Whittaker, Clark & Daniels, New York		CEMENT, INSULATING		Cooper, Chas., & Co., New York 1111	
CEMENT, ASPHALT		Armstrong Cork & Insulation Co., Pittsburgh 295-297		New York Belting & Packing Co., New York 725	
Barber Asphalt Paving Co., Phila- delphia 1098		Celite Products Company, New York 388-389		Dewey & Almy Chem. Co., Cam- bridge, Mass.	
Warren Chemical Division, New York 936		Norristown Magnesia & Asbestos Co., Norristown, Pa. 730		Van Cleef Bros., Chicago	
CEMENT, BAKELITE		Truscon Laboratories, Detroit 899		CEMENT, SILICA	
General Bakelite Co., New York 502		Wallis Dove - Hermiston Corp., New York 931		Richa, Edward L., Baltimore	
CEMENT, BELT		Condensite Co., Bloomfield, N. J. Minwax Co., New York		CEMENT, WATERPROOF	
Du Pont de Nemours, E. I., & Co., Inc., Wilmington 1116-1118		CEMENT, LEATHER BELTING, WATERPROOF. See Cement, Belt		Armstrong Cork & Insulation Co., Pittsburgh 295-297	
Fries & Fries Co., Cincinnati 1122		CEMENT, MAGNESITE		Barber Asphalt Paving Co., Phila- delphia 1098	
CEMENT, BITUMASTIC		Amer. Refractories Co., Pitts- burgh		Fries & Fries Co., Cincinnati 1122	
Wallis Dove - Hermiston Corp., New York 931				Truscon Laboratories, Detroit 899	

The Symbol "®" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

CEMENT, WATERPROOF—Con		CENTRIFUGALS, DEHYDRATING (DRYING)—Con		CENTRIFUGALS, SEPARATING—Con	
Amer Cellulose Co., Indianapolis		Tolhurst Machine Works, Troy, N. Y.	896-897	Oil & Waste Saving Mach. Co., Phila.	
Minwax Co., New York		U. S. & Cuban Allied Works Engineering Corp., New York	920	Sharples Specialty Co., Phila.	
Moreno Products Co., New York		De Laval Separator Co., New York		<b>CENTRIFUGALS, SEPARATING AND CLARIFYING</b>	
Standard Paint Co., New York		Kaestner & Hecht Co., Chicago		American Tool & Machine Co., Boston	282-283
Texas Co., New York		<b>CENTRIFUGALS, HAND POWER</b>		Cresson-Morris Company, Philadelphia	422-423
Toch Bros., New York		American Tool & Machine Co., Boston	282-283	Fletcher Works, Philadelphia	482-483
Van Schaack Bros Chem Wks., Chicago		International Equipment Co., Boston	596	Tolhurst Machine Works, Troy, N. Y.	896-897
<b>CEMENT, "ZIRKITE"</b>		Tolhurst Machine Works, Troy, N. Y.	896-897	U. S. & Cuban Allied Works Engineering Corp., New York	920
Foot Mineral Co., Phila.		Boulton Camille H. New York		De Laval Separator Co., New York	
<b>CEMENT MILL MACHINERY</b>		De Laval Separator Co., New York		Kaestner & Hecht Co., Chicago	
American Tool & Machine Co., Boston	282-283	Sharples Specialty Co., Phila.		Oil & Waste Saving Mach. Co., Phila.	
Bartlett, C. O., & Snow Co., Cleveland	338	<b>CENTRIFUGALS, INDUSTRIAL</b>		Sharples Specialty Co., Phila.	
Caldwell, H. W., & Son Co., Chicago	381	American Tool & Machine Co., Boston	282-283	<b>CENTRIFUGALS, "WESTON"</b>	
Gifford-Wood Company, Hudson, N. Y.	522	Buffalo Forge Co., Buffalo	441	American Tool & Machine Co., Boston	282-283
Hardinge Company, New York	544-545	Consolidated Products Co., New York	411	<b>CENTRIFUGES. See Centrifugals</b>	
Jeffrey Manufacturing Co., Columbus, O.	606-607	Cresson-Morris Company, Philadelphia	422-423	<b>CEPHALIN</b>	
Kent Mill Company, Brooklyn, N. Y.	630	Elmore, G. H., Philadelphia	464	Wilson & Co., Chicago	1211
Link-Belt Company, Chicago	667	Fletcher Works, Philadelphia	482-483	<b>CERAMIC COLORS. See Colors, Ceramic</b>	
Meade, Richard K. & Co., Baltimore	696	Glander & Company, Newark, N. J.	524-525	<b>CERESIN</b>	
Newbold, R. S., & Sons Co., Norristown, Pa.	722	Hepworth, S. S., Company, New York	554	Lamson, John S., & Bro., New York	1146
Pennsylvania Crusher Co., Philadelphia	751	Ingersoll Rand Co., New York	590-591	Union Chemical Co., Boston	1198
Ruggles - Coles Engineering Co., New York	818	International Equipment Co., Boston	596	<b>CERIC-AMMONIUM NITRATE</b>	
Stroud, E. H., & Co., Chicago	861	Ott, George F. Co., Philadelphia	741	Welsbach Co., Gloucester, N. J.	1210
Struthers-Wells Co., Warren, Pa.	864	Tolhurst Machine Works, Troy, N. Y.	896-897	Lindsay Light Co., Chicago	
Tippett & Wood, Phillipsburg, N. J.	891	U. S. & Cuban Allied Works Engineering Corp., New York	920	<b>CERIC-AMMONIUM SULFATE</b>	
Weller Manufacturing Co., Chicago	941	De Laval Separator Co., New York		Lindsay Light Co., Chicago	
<b>CEMENT PRESERVATIVE COMPOUNDS</b>		Kaestner & Hecht Co., Chicago		<b>CERIUM CARBONATE</b>	
Truscon Laboratories, Detroit	839	Sharples Specialty Co., Phila.		Welsbach & Co., Gloucester, N. J.	1210
Walles Dove - Hermiston Corp., New York	931	<b>CENTRIFUGALS, LABORATORY</b>		Foot Mineral Co., Phila.	
<b>CEMENT TESTING APPARATUS. See Testers, Cement</b>		American Tool & Machine Co., Boston	282-283	Lindsay Light Co., Chicago	
<b>CEMENTOL</b>		Bausch & Lomb Optical Co., Rochester, N. Y.	340-341	<b>CERIUM CHLORIDE</b>	
Boehm, Fredk., Ltd., New York		Brooklyn Thermometer Co., Brooklyn, N. Y.	368	Synthetical Laboratories of Chicago, Chicago	1191
<b>CENTRALINE BLACK BH</b>		Clafin, Geo. L. Co., Providence	49	Welsbach & Co., Gloucester, N. J.	1210
Metz, H. A., & Co., Inc., New York	1151	Elmer & Amend, New York	157	Foot Mineral Co., Phila.	
Central Dyestuff & Chem. Co., Newark, N. J.		Fletcher Works, Philadelphia	482-483	Lindsay Light Co., Chicago	
<b>CENTRALINE BLUE 2B</b>		Glass Specialty Co., Newark, N. J.	523	<b>CERIUM FLUORIDE</b>	
Metz, H. A., & Co., Inc., New York	1151	International Equipment Co., Boston	596	Welsbach & Co., Gloucester, N. J.	1210
Central Dyestuff & Chem. Co., Newark, N. J.		Marshall Rieha, Inc., Baltimore	692	Lindsay Light Co., Chicago	
<b>CENTRALINE BLUE 3B</b>		Mine & Smelter Supply Co., New York	704-705	<b>CERIUM HYDRATE</b>	
Metz, H. A., & Co., Inc., New York	1151	Palo Company, New York	719	Lindsay Light Co., Chicago	
Central Dyestuff & Chem. Co., Newark, N. J.		Rovey Instrument & Chemical Co., Buffalo	811	<b>CERIUM-IRON. See Ferrocerium</b>	
<b>CENTRALINE PAST RED F</b>		Scientific Instrument Co., New York	851	<b>CERIUM METAL</b>	
Metz, H. A., & Co., Inc., New York	1151	Standard Scientific Co., New York	857	Foot Mineral Co., Phila.	
Central Dyestuff & Chem. Co., Newark, N. J.		Tolhurst Machine Works, Troy, N. Y.	896-897	New Process Metals Corp., Newark, N. J.	
<b>CENTRALINE VIOLET N</b>		Will Corporation, Rochester, N. Y.	972-1066	<b>CERIUM NITRATE</b>	
Metz, H. A., & Co., Inc., New York	1151	De Laval Separator Co., New York		Hummel & Robinson Corp., New York	1135
Central Dyestuff & Chem. Co., Newark, N. J.		Hill Henry Chem Co., St. Louis		Welsbach Co., Gloucester, N. J.	1210
<b>CENTRIFUGAL EXTRACTORS. See Centrifugals</b>		Reynolds - Teschner & Volk Co., New York		Atkins, David J., New York	
<b>CENTRIFUGALS, ANALYTICAL. See Centrifugals, Laboratory</b>		Sharples Specialty Co., Phila.		Foot Mineral Co., Phila.	
<b>CENTRIFUGALS, CLARIFYING</b>		<b>CENTRIFUGALS, LABORATORY, CHAUNT'S "CYCLONE"</b>		Harrison Mfg. Co., Rahway, N. J.	
American Tool & Machine Co., Boston	282-283	Boulton Camille H. New York		Lindsay Light Co., Chicago	
Consolidated Products Co., New York	411	<b>CENTRIFUGALS, "MACKINTOSH"</b>		Standard Chem. Co., Bayonne, N. J.	
Cresson-Morris Company, Philadelphia	422-423	Hepworth, S. S., Company, New York	554	<b>CERIUM OXALATE</b>	
Fletcher Works, Philadelphia	482-483	<b>CENTRIFUGALS, "MORRIS-WESTON" BALL BEARING</b>		Hummel & Robinson Corp., New York	1135
Glander & Company, Newark, N. J.	524-525	Cresson-Morris Company, Philadelphia	422-423	Welsbach Co., Gloucester, N. J.	1210
International Equipment Co., Boston	596	<b>CENTRIFUGALS, NITRATING</b>		Foot Mineral Co., Phila.	
Tolhurst Machine Works, Troy, N. Y.	896-897	U. S. & Cuban Allied Works Engineering Corp., New York	920	Lindsay Light Co., Chicago	
U. S. & Cuban Allied Works Engineering Corp., New York	920	<b>CENTRIFUGALS, OIL RECOVERY</b>		<b>CERIUM PHOSPHATE</b>	
De Laval Separator Co., New York		American Tool & Machine Co., Boston	282-283	Foot Mineral Co., Phila.	
Kaestner & Hecht Co., Chicago		Oil & Waste Saving Mach. Co., Phila.		<b>CERIUM SULFATE</b>	
Sharples Specialty Co., Phila.		<b>CENTRIFUGALS, OIL RECOVERY "ROPER"</b>		Welsbach Co., Gloucester, N. J.	1210
<b>CENTRIFUGALS, CLARIFYING AND FILTERING</b>		American Tool & Machine Co., Boston	282-283	Foot Mineral Co., Phila.	
Cresson-Morris Company, Philadelphia	422-423	<b>CENTRIFUGALS, SEPARATING</b>		Lindsay Light Co., Chicago	
U. S. & Cuban Allied Works Engineering Corp., New York	920	American Tool & Machine Co., Boston	282-283	<b>CESIUM CHLORIDE</b>	
De Laval Separator Co., New York		Cresson-Morris Company, Philadelphia	422-423	Synthetical Laboratories of Chicago, Chicago	1191
Sharples Specialty Co., Phila.		Fletcher Works, Philadelphia	482-483	<b>CESIUM SALTS</b>	
<b>CENTRIFUGALS, CONTINUOUS</b>		Glander & Company, Newark, N. J.	524-525	Synthetical Laboratories of Chicago, Chicago	1191
Elmore, G. H., Philadelphia	464	International Equipment Co., Boston	596	Foot Mineral Co., Phila.	
<b>CENTRIFUGALS, DEHYDRATING (DRYING)</b>		Tolhurst Machine Works, Troy, N. Y.	896-897	<b>CESIUM SILICATE</b>	
American Tool & Machine Co., Boston	282-283	U. S. & Cuban Allied Works Engineering Corp., New York	920	Foot Mineral Co., Phila.	
Cresson-Morris Company, Philadelphia	422-423	De Laval Separator Co., New York		<b>CEYLON RED</b>	
Elmore, G. H., Philadelphia	464	Kaestner & Hecht Co., Chicago		National Aniline & Chemical Co., Inc., New York	1159
Fletcher Works, Philadelphia	482-483	<b>CHADDOCK'S SUPPORTS AND CLAMPS. See Laboratory Apparatus and Supplies</b>		<b>"CHAINOMATIC" BALANCES. See Balances, "Chainomatic"</b>	
Glander & Company, Newark, N. J.	524-525	<b>CHAINS</b>			
Hepworth, S. S., Company, New York	554	Caldwell, H. W., & Son Co., Chicago	381		
Link-Belt Co., Chicago	667	Dow Co., Louisville, Ky.	444		

Mentioning this catalog when writing firms enables us to give you a better reference work next year.  
For List of Scientific and Technical Books, see page 1215

CHAINS—Con		PAGE CHARCOAL—Con.		PAGE CHARCOAL—Con.	
Jeffrey Manufacturing Co., Colum- bus, O.	606-607	Barnum Richardson Co., E Ca- naan, Conn.		Tionesta Valley Chem Co., May- burg, Pa.	
Link-Belt Company, Chicago	667	Bartley, John, Mt. Alton, Pa.		Troy, George I., Cook Falls, N. Y.	
Morse Chain Company, Ithaca, N. Y.	712	Berkston Acetate Co., Olean, N. Y.		Tupper Lake Chem Co., Tupper Lake, N. Y.	
Webster Manufacturing Co., Chi- cago	940	Blue Ridge Wood Chem. Co., Charlestown, W. Va.		Tyler-Hall Chem. Co., Hancock, N. Y.	
Weller Manufacturing Co., Chicago	941	Boyer City Chem. Co., Boyne City, Mich.		Vandalia Chem. Co., Olean, N. Y.	
<b>CHAINS, ATERITE</b>		Buckhannon Chem. Co., Olean, N. Y.		Whittaker, Clark & Daniels, New York	
Aterite Company, New York	300-301	Burston Acetate Co., Olean, N. Y.		Wittig, F. & Co., Milwaukee	
<b>CHAINS, LINK BELT</b>		Cadillac Chem. Co., Cadillac, Mich.		Wood Prod. Co., Buffalo	
Jeffrey Manufacturing Co., Colum- bus, O.	606-607	Charcoal Iron Co. of Amer., Detroit		Wright Chem. Co., Ridgway, Pa.	
Link-Belt Company, Chicago	667	Charcoal Supply Co., Chicago		Wright, T. B. & Co., Berlin, N. J.	
<b>CHAINS, SILENT DRIVE</b>		Chatham Mfg. Co., Savannah, Ga.		Wyman Chem. Co., Port Alle- gheny, Pa.	
Jeffrey Manufacturing Co., Colum- bus, O.	606-607	Cleveland-Chiffa Iron Co., Cleve- land		Wyo Chem. Co., Pittston, Pa.	
Link-Belt Company, Chicago	667	Collier, W. C. & Sons, Bingham- ton, N. Y.		<b>CHARCOAL, ANIMAL (BONE, BLOOD, ETC.).</b> See also	
Morse Chain Company, Ithaca, N. Y.	712	Corbett, M. J. & Co., St. Marys, Pa.		Black, Bore	
Weller Manufacturing Co., Chicago	941	Corbett & Stuart, Corbett, N. Y.		Binney & Smith Co., New York	1099
<b>CHAINS, STEEL ROLLER</b>		Corryville Chem. Co., Corryville, Pa.		Cooper, Chas., & Co., New York	1111
Dow Co., Louisville, Ky.	444	Crosby Chem. Co., Bklyn		Baugh & Sons Co., Phila	
Gifford-Wood Co., Hudson, N. Y.	522	Cummer-Diggins Co., Cadillac, Mich.		Buffalo Dental Mfg. Co., Buffalo	
Jeffrey Manufacturing Co., Colum- bus, O.	606-607	Day Chem. Co., Westline, Pa.		Whittaker, Clark & Daniels, New York	
Link-Belt Company, Chicago	667	Delta Chem. Co., Wells, Mich.		<b>CHARCOAL, POWDERED</b>	
Ott, George F. Co., Philadelphia	744	East Jordan Chem. Co., E. Jor- dan, Mich.		Binney & Smith Co., New York	1099
Weller Manufacturing Co., Chicago	941	Elm Wood Prod. Co., Jackson- ville, Fla.		Industrial Chemical Co., Inc., New York	1136
<b>CHALK</b>		Forest Chem. Co., Sheffield, Pa.		Powers - Weightman - Rosengarten Co., Philadelphia	1172
Binney & Smith Co., New York	1099	Forest Prod. Chem. Co., Memphis, Tenn.		Whittaker, Clark & Daniels, New York	
Cooper, Chas., & Co., New York	1111	Gaffney Wood Prod. Co., Walton, Pa.		Wright, T. B. & Co., Berlin, N. J.	
Crosthwaite, Ralph L., Co., New York	1112	Garrigus, Chas. F., Co., New York		<b>CHARCOAL, BY-PRODUCT, OVENS.</b> See Ovens, Wood Distillation	
Drakenfeld, B. F. & Co., Inc., New York	1115	Genee Chem. Co., Genesee, Pa.		<b>CHEMCO COLORS</b>	
Harshaw Fuller & Goodwin Co., Cleveland	1127	Gray, Wm. S. & Co., New York		Chemical Company of Amer., New York	
Industrial Chemical Co., Inc., New York	1176	Gravling Wood Prod. Co., Grav- ling, Mich.		<b>CHASERS.</b> See Mills, Paint	
Powers - Weightman - Rosengarten Co., Philadelphia	1172	Hennemann Chem. Co., Olean, N. Y.		<b>"CHEMI STEEL" EQUIPMENT</b>	
Baker, H. J. & Bro., New York		Indus Dist. Co., Waterloo, N. Y.		Kellogg, M. W., Co., New York	622-623
Mempham, Geo. S. & Co., E. St. Louis, Ill.		James Ross, Mfg. Co., Kane, Pa.		<b>CHEMICAL ENGINEERS.</b> See Engi- neers, Chemical	
Product Sales Co., Bldg.		Kerry, Thos. Co., Hancock, N. Y.		<b>CHEMICAL LIME.</b> See Calcium Oxide, Technical	
Rockhill & Victor, New York		Ky Wood Prod. Co., Kiagon, Ky.		<b>CHEMICAL MACHINERY.</b> See un- der specific heads	
Whittaker, Clark & Daniels, New York		Keystone Wood Prod. Co., Olean, N. Y.		<b>CHEMICAL PLANTS.</b> See under spe- cific heads	
<b>CHAMBER PACKING, ACID-PROOF</b>		Kinzua Valley Chem. Co., Will- iamsport, Pa.		<b>CHEMICAL PROCESSES.</b> See under specific heads	
Acid Proof Clay Products Co., Ak- ron, O.	248	Lacka Chem. Co., Olean, N. Y.		<b>CHEMICAL REAGENTS.</b> See Chem- icals, fine, for reagent and labo- ratory purposes	
Crescent Refractories Co., Cin- cinnatusville, Pa.	419	Lamont Chem. Co., Lamont, Pa.		<b>CHEMICALS.</b> See under specific heads	
General Ceramics Co., New York	504-505	Leighton Arthur, Co., Cooks Falls, N. Y.		Note: The firms listed under the name of any chemical in this index are usually those who supply a commercial grade of the article in large quantities. If a small quan- tity of a very pure grade is re- quired refer to the firms listed under the heading "Chemicals, Fine, for Reagent and Laboratory Purposes." The firms under this heading can supply almost any known chemical, organic or in- organic, in small quantities in C.P. or U.S.P. grades.	
Hood, B. Mifflin, Brick Co., Atlanta, Ga.	569	Luzerne Chem. Co., Pittston, Pa.		<b>CHEMICALS, FINE, FOR REAGENT AND LABORATORY PURPOSES</b>	
Knight, Maurice A., E. Akron, O.	638-649	McKean Chem. Co., Williams- port, Pa.		Baker, J. T., Chemical Co., Phil- lipsburg, N. J.	1095
<b>CHAMBER PLANTS.</b> See Acid Plants, Sulfuric		McKellar, R., Sons, Co., Pecks- kill, N. Y.		Brooklyn Thermometer Co., Brook- lyn, N. Y.	368
<b>CHAMBER PLANTS, DETAILS</b>		Maryndale Chem. Co., Maryn- dale, Pa.		Claffin, Geo. L., Co., Providence, R. I.	405
Acid Proof Clay Products Co., Ak- ron, O.	248	Md. Wood Prod. Co., Maryland, N. Y.		Cooper, Chas., & Co., New York	1111
Fairlie, Andrew M., Atlanta	554	Milwaukee Chem. Co., Milwaukee, Pa.		Dalger, A., & Co., Chicago	428
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Knight, Maurice A., E. Akron, O.	638-649	Natl. Chem. Co., Bradford, Pa.		Glass Specialty Co., Newark, N. J.	523
Marshall Bieha, Inc., Baltimore	692	Natl. Electrolytic Co., Niagara Falls		Heyl Laboratories, New York	1132
Packards & James Fison (Thet- ford), Ltd., Ipswich, Eng.	748	Newman, E. B., Char. Co., New York		LaMotte Chemical Products Co., Baltimore	1144-1145
Thermal Syndicate, Ltd., New York	886-889	Newton Chem. Co., Olean, N. Y.		Marshall Bieha, Inc., Baltimore	692
<b>CHAMOTTES</b>		Nordmont Chem. Co., Pittston, Pa.		Pfizer, Chas., & Co., New York	1170
Acid Proof Clay Products Co., Ak- ron, O.	248	Nubium Chem. Co., Bradford, Pa.		Palo Company, New York	749
General Ceramics Co., New York	504-505	Oregon Wood Dist. Co., Portland, Ore.		Powers - Weightman - Rosengarten Co., Philadelphia	1172
Knight, Maurice A., E. Akron, O.	638-649	Oswayo Chem. Co., Bradford, Pa.		Rovey Instrument & Chemical Co., Buffalo	814
Chemical Construction Co., Char- lotte, N. C.		Otto Chem. Co., Williamsport, Pa.		Standard Scientific Co., New York	852
<b>CHANCELL'S APPARATUS</b>		Pensacola Tar & Turpentine Co., Gulfport, Fla.		Synthetic Laboratories of Chi- cago, Chicago	1191
Brooklyn Thermometer Co., Brook- lyn, N. Y.	368	Penn Chem. Co., Ridgway, Pa.		Will Corporation, Rochester, N. Y.	972-1066
Claffin, Geo. L., Co., Providence	405	Phipps Char. Co., Ironton, O.		<b>CHEMICALS, PHOTOSTAT</b>	
Dalger, A., & Co., Chicago	428	Pierce & Stevens, Buffalo		Photostat Corporation, Providence, R. I.	764
Eimer & Amend, New York	457	Pine Nene Prod. Co., Jackson- ville, N. C.		<b>"CHEMICO" CONCENTRATORS.</b> See Concentrators, "Chemico"	
Glass Specialty Co., Newark, N. J.	523	Rowand, John R., Clementon, N. J.			
Griebel Instrument Co., Carbondale, Pa.	537	Russell Chem. Co., Russell, Pa.			
Hiergesell Brothers, Philadelphia	560	Salzberg, Geo. H., St. Louis			
Marshall Bieha, Inc., Baltimore	692	Silko Furnace Co., St. Louis			
Palo Company, New York	749	Smith, J. B., Chem. Co., Buffalo			
Rovey Instrument & Chemical Co., Buffalo	814	Standard Chem. Co., Toronto			
Scientific Utilities Co., Inc., New York	826-827	Stauuca Chem. Co., Stauuca, Pa.			
Standard Scientific Co., New York	852	Straight Creek Chem. Co., Olean, N. Y.			
Will Corporation, Rochester, N. Y.	972-1066	Sullivan Chem. Co., Acidalia, N. Y.			
<b>CHAPMAN PUMPS.</b> See Pumps, Chapman		Susquehanna Chem. Co., Straight, Pa.			
<b>CHARCOAL</b>		Thayer, Martin, & Son, Boston			
Binney & Smith Co., New York	1099				
Cooper, Chas., & Co., New York	1111				
Harshaw, Fuller & Goodwin Co., Cleveland	1127				
Industrial Chemical Co., Inc., New York	1130				
Amer. Turpentine & Tar Co., New York					
Barclay Chem. Co., Olean, N. Y.					

The Symbol "☞" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12



## CHEMISTS, ANALYTICAL

This list is not intended as a directory. It is merely a reference to the users of space in this volume who have expert services to offer.

Electrochemical Supply & Engineering Co., Philadelphia	460
Fairlie, Andrew M., Atlanta, Ga.	474
Lewis, Greene, McAdams & Knowland, Boston	661
Little, Arthur D., Inc., Cambridge, Mass.	668
Meade, Richard K., & Co., Baltimore, Md.	696
Melgs, Bassett, & Slaughter, Inc., Philadelphia	697

## CHEMISTS, CONSULTING

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Meade, Richard K., & Co., Baltimore, Md.	696
Melgs, Bassett, & Slaughter, Inc., Philadelphia	697

## CHEMISTS, INDUSTRIAL RESEARCH

See Chemists, Research

## CHEMISTS, METALLURGICAL

This list is not intended as a directory. It is merely a reference to the users of space in this volume who have expert services to offer.

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Meade, Richard K., & Co., Baltimore, Md.	696
Melgs, Bassett, & Slaughter, Inc., Philadelphia	697

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Little, Arthur D., Inc., Cambridge, Mass.	668
Meade, Richard K., & Co., Baltimore, Md.	696
Melgs, Bassett, & Slaughter, Inc., Philadelphia	697

## CHESAPEAKE CRANES

See Chesapeake Iron Works, Baltimore

## CHESTNUT EXTRACT

See Extract, Chestnut-Oak

## CHESTNUT-OAK EXTRACT

See Extract, Chestnut-Oak

## CHEWING GUM MACHINERY

Baker, Joseph, Sons & Perkins, Inc., White Plains, N. Y.

Werner & Pfleiderer Co., White Plains, N. Y.

942-943

CHILI SALT-PETER. See Sodium Nitrate

## CHILLING MACHINES

Arctic Ice Machine Co., Canton, O.

Automatic Refrigerating Co., Hartford, Conn.

397

Vogt, Henry, Machine Co., Louisville, Ky.

926-927

Brecht Co., St. Louis

Carbondale Mach. Co., Carbondale, Pa.

Mechanical Mfg. Co., Chicago

Perrin Wm R. & Co., Chicago

CHIMNEYS, ACID-PROOF

American Chimney Corp., New York

265

Custodis, Alphons, Chimney Construction Company, New York

426

Hoosier Stack & Construction Co., Indianapolis

571

Kellogg, M. W., Co., New York

622-623

CHIMNEYS, CHEMICAL PLANT

See also Stacks, Steel

American Chimney Corp., New York

265

Custodis, Alphons, Chimney Construction Company, New York

426

Hoosier Stack & Construction Co., Indianapolis

571

Kellogg, M. W., Co., New York

622-623

New York Central Iron Works Co., Hagerstown, Md.

726

Rust Eng. Co., Pittsburgh

Weber Chimney Co., Chicago

Wiederholdt Const. Co., St. Louis

## CHIMNEYS, ORNAMENTAL

American Chimney Corp., New York

265

## CHIMNEYS, RADIAL BRICK

American Chimney Corp., New York

265

Custodis, Alphons, Chimney Construction Company, New York

426

Hoosier Stack & Construction Co., Indianapolis

571

Kellogg, M. W., Co., New York

622-623

## CHIMNEYS, REINFORCED CONCRETE

Kellogg, M. W., Co., New York

622-623

General Concrete Construction Co., Chicago

Rust Eng. Co., Pittsburgh

Weber Chimney Co., Chicago

CHIMNEY, STEEL. See Stacks, Steel

CHIMNEYS, VITREOUS

Thermal Syndicate, Ltd., New York

886-889

CHINA CLAY. See Kaolin

CHINESE BLUE. See Blue, Chinese

CHINA GRASS (RAMIE)

Jardine, Matheson & Co., New York

1110

CHLORIDIN

Powers - Weightman - Rosengarten Co., Philadelphia

1152

Greiff R. W. & Co., New York

"CHIROOK" HEATERS

Bayley Manufacturing Co., Milwaukee

349

CHIFFERS

Mitts & Merrill, Saginaw, Mich.

Sandy Hill Iron & Brass Wks., Hudson Falls, N. Y.

Valley Iron Wks. Co., Appleton, Wis.

CHIPPERS, SOAP

Albright-Nell Co., Chicago

260

Houchin-Alken Co., Brooklyn, N. Y.

548-549

CHIPS, DYEWOOD

American Dyewood Co., New York

1090

CHLORAL HYDRATE

Greiff R. W. & Co., New York

Merck & Co., New York

Monanto Chem. Wks., St. Louis

CHLORAMINE "T"

Carrs Chem. Co., La Salle, Ill.

Monanto Chem. Wks., St. Louis

CHLORAMINE YELLOW

Dye Prod. & Chem. Co., New York

CHLORAZONE

Lectra Chlorazone Wks., Bklyn.

CHLOROBENZOL. See Chlorobenzene

CHLOREOSANE

Abbott Labs., Chicago

"CHLORIDE OF LIME" (NOT CALCIUM CHLORIDE). See Bleach

CHLORINATING APPARATUS

Badger, E. B., & Sons Co., Boston

310-329

Buffalo Foundry & Machine Co., Buffalo

374-379

Hercules Engineering Corp., New York

556-559

Lummus, Walter E., Co., Boston

674-681

CHLORINE

Brown Company, Portland, Me.

1100

Electro Bleaching Gas Co., New York

1121

Hooker Electrochemical Co., New York

1134

Kilpstein, A., & Co., New York

1143

Mathieson Alkali Works, Inc., New York

1152

Pennsylvania Salt Mfg. Co., Philadelphia

1169

Roeseler & Hasselacher Chemical Co., New York

1178-1179

Warner Chemical Company, New York

1209

Barada, Gordon & Page, Kansas City

Castner Electrolytic Alkali Co., Niagara Falls

Chlorine Prod. Co., Chicago

Condensate Co., Bloomfield, N. J.

Great W. Electro Chem. Co., San Fran.

Innes, Spiden & Co., New York

Niagara Smelt. Corp., Niagara Falls

Nichols Chem. Co., Montreal

CHLORINE CONTAINERS, FORGE WELDED

Kellogg, M. W., Co., New York

622-623

CHLORINE, ELECTROLYTIC CELLS

FOR

Bleach Process Company, Appleton, Wis.

357

Electrochemical Supply & Engineering Co., Philadelphia

460

## CHLORINE, ELECTROLYTIC CELLS

FOR—

Electron Chemical Company, Portland, Me.

462-463

Hooker Electrochemical Co., New York

1134

Struthers-Wells Co., Warrenton, Pa.

864-865

Warner Chemical Co., New York

936

Chlorine Prod. Co., Chicago

Green, Saml. M. Co., Springfield, Mass.

Process Eng., Inc., New York

CHLORINE, ELECTROLYTIC PLANTS FOR

Bleach Process Company, Appleton, Wis.

357

Electrochemical Supply & Engineering Co., Philadelphia

460

Electron Chemical Company, Portland, Me.

462-463

Hercules Engineering Corp., New York

556-559

Warner Chemical Co., New York

936

CHLORINE, LIQUID. See Chlorine

CHLORINE CONTROL APPARATUS

Winn & Therman Co., New York

CHLORINE GENERATORS. See Generators, Chlorine

CHLORINE HELMETS. See Gas Masks

CHLORINE PUTTY. See Putty, Chlorine

CHLOROBENZENE

Du Pont de Nemours, E. I. & Co., Wilmington, Del.

1116-1118

Hooker Electrochemical Co., New York

1134

Kilpstein, A., & Company, New York

1143

National Aniline & Chemical Co., Inc., New York

1159

Niagara Alkali Co., Niagara Falls, N. Y.

1163

Warner Chemical Company, New York

1209

Greely Prod. Corp., New York

Monanto Chem. Wks., St. Louis

Rockwell & Aetor, New York

CHLOROBENZENE PLANTS

Badger, E. B., & Sons Co., Boston

310-329

Electron Chemical Co., Portland, Me.

462-463

Hercules Engineering Corp., New York

556-559

Lummus, Walter E., Co., Boston

674-681

Warner Chemical Co., New York

936

CHLOROFORM

Albany Chemical Co., Albany, N. Y.

1087

Brown Company, Portland, Me.

1100

Cooper, Chas., & Co., New York

1111

Dow Chemical Co., Midland, Mich.

1114

Pfizer, Chas., & Co., Inc., New York

1170

Powers - Weightman - Rosengarten Co., Philadelphia

1172

Roeseler & Hasselacher Chemical Co., New York

1178-1179

Warner Chemical Co., New York

1209

Hoffman-La Roche Chem. Wks., New York

Johnson & Johnson, New Brunswick, N. J.

Merck & Co., New York

CHLOROFORM PLANTS

Badger, E. B., & Sons Co., Boston

310-329

Groen Mfg. Co., Chicago

538

Hercules Engineering Corp., New York

556-559

Lummus, Walter E., Co., Boston

674-681

CHLOROETHYL ACETATE

Dow Chemical Co., Midland, Mich.

1114

CHLORO-NAPHTHALENES

Condensate Co., Bloomfield, N. J.

CHLORO-PARA-TOLUOL-SODIUM-SULFONATE, ORTHO-

Monanto Chem. Wks., St. Louis

"CHLOROXINE"

# CHOLESTEROL

68

# CHRYSOIDINE

CHOLESTEROL		CHROME GREEN, DRY COLOR.		CHROMIUM-COPPER	
Synthetical Laboratories of Chicago, Chicago	1191	See Chromium Oxide		Metal & Thermit Corp., New York	
Special Chem. Co., Highland Park, Ill.		<b>CHROME ORANGE</b>		<b>CHROMIUM FORMATE</b>	
<b>CHOLESTERYL ACETATE</b>		Althouse Chem. Co., Reading, Pa.		Victor Chemical Works, Chicago...	1207
Synthetical Laboratories of Chicago, Chicago	1191	Chemical Co. of Amer., New York		<b>CHROMIUM LINOLEATE</b>	
<b>CHOLESTERYL BENZOATE</b>		<b>CHROME ORANGE GG</b>		Sargent, Chas. R., Co., Cleveland	
Synthetical Laboratories of Chicago, Chicago	1191	Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	<b>CHROMIUM ORES</b>	
<b>CHOPPERS, PAPER</b>		<b>CHROME ORE.</b> See Chromium Oxide		Grasselli Chemical Co., Cleveland.	1125
Lamson, Saml. M., Co., Camden, N. J.		<b>CHROME OXIDE.</b> See Chromium Oxide		National Sales Co., Cincinnati	1161
<b>CHROMANOL COLORS</b>		<b>CHROME RED</b>		Amer. Refractories Co., Pittsburgh	
United Chem. Prod. Corp., Jersey City		Klipstein, A., & Co., New York	1143	Atkins, Kroll & Co., San Fran.	
<b>CHROMALYN</b>		Wolf, Jacques & Co., Passaic, N. J.	1212	Binswanger, H. P., New York	
Apex Chem. Company, New York	1094	Althouse Chem. Co., Reading, Pa.		Butcher, L. H., Co., New York	
<b>CHROMATES.</b> See under base		American Aniline Prod., New York		E. Mining Co., Yreka, Cal.	
<b>CHROME ACETATE.</b> See Chromium Acetate		Chemical Co. of Amer., New York		Foot Mineral Co., Phila.	
<b>CHROME ALUM.</b> See Alum, Chrome		Dye Prod. & Chem. Co., New York		Harbison-Walker Refractories Co., Pittsburgh	
<b>CHROME BLACK</b>		<b>CHROME RED A4B</b>		Hardy, Chas., New York	
Klipstein, A., & Co., New York	1143	Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	Lavino, E. J., & Co., Phila.	
Metz, H. A., & Co., Inc., New York	1151	<b>CHROME SALT D</b>		Levensader-Speir Corp., San Fran.	
Wolf, Jacques & Co., Passaic, N. J.	1212	Durfee, Winthrop, Boston		Naylor & Co., Inc., New York	
Amer. Aniline Prod., New York		<b>CHROME SCARLET</b>		Noble Elec. Steel Co., San Fran.	
Holliday-Kemp Co., New York		Althouse Chem. Co., Reading, Pa.		Shumer & Co., Phila.	
Sherwin-Williams Co., Cleveland		<b>CHROME SOLUTION.</b> See Chromium Sulfate		<b>CHROMIUM OXIDE</b>	
Wetterwald & Pfister, New York		<b>CHROME SULFATE.</b> See Chromium Sulfate		Chaplain & Bibbo, New York	1106
<b>CHROME BLACK A</b>		<b>CHROME TANNAGE.</b> See Tannage, Chrome		Cooper, Chas. & Co., New York	1111
Metz, H. A., & Co., Inc., New York	1151	<b>CHROME VIOLET</b>		Daigger, A., & Co., Chicago	428
<b>CHROME BLACK FF</b>		Butterworth-Judson Corp., New York	1102	Drakenfeld, B. F., & Co., Inc., New York	1115
Butterworth-Judson Corp., New York	1102	<b>CROME YELLOW</b>		Harshaw Fuller & Goodwin Co., Cleveland	1127
<b>CHROME BLUE</b>		Klipstein, A., & Co., New York	1143	Klipstein, A., & Co., New York	1113
Chemical Co. of America, Inc., New York		Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	McNulty, Joseph A., New York	1150
<b>CHROME BLUE G EXTRA</b>		<b>CHROME YELLOW G</b>		Roesler & Hasselacher Chemical Co., New York	1178-1179
Newport Chemical Works, Inc., Passaic, N. J.	1161-1165	Newport Chemical Works, Passaic, N. J.	1164-1165	Siegler, G., Corp., of America, Roseland, N. J.	1181
<b>CHROME BLUE BLACK</b>		Calco Chem. Co., Bound Brook, N. J.		Smith Chemical & Color Co., New York	1190
Dye Products & Chemical Co., New York		<b>CHROME YELLOW 2R</b>		Waldo, E. M. & F., New York	1208
<b>CHROME BLUE BLACK R</b>		Metz, H. A., & Co., Inc., New York	1151	Ansbacher, A. B., & Co., New York	
Butterworth-Judson Corp., New York	1102	<b>CHROME YELLOW 3G</b>		Bardewick, R., New York	
<b>CHROME BLUE BLACK V</b>		Metz, H. A., & Co., Inc., New York	1151	Calif. Ink Co., W. Berkeley, Calif.	
Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	<b>CHROME YELLOW 5G</b>		Genl. Metallic Oxides Co., New York	
<b>CHROME BORDEAUX</b>		Metz, H. A., & Co., Inc., New York	1154	Import Chem. Co., Jersey City	
Butterworth-Judson Corp., New York	1102	<b>CHROME YELLOW, DRY COLOR.</b> See Lead Chromate		Stresen-Reuter & Biser, Chicago	
<b>CHROME BROWN</b>		<b>"CHROMEL" APPARATUS</b>		Sun Chem. & Color Co., Harrison, N. J.	
Butterworth-Judson Corp., New York	1102	Hoskins Mfg. Co., Detroit	5574-5575	Utility Color & Chem. Co., Newark, N. J.	
Klipstein, A., & Co., New York	1111	<b>CHROMITE.</b> See Chromium Oxide		<b>CHROMIUM OXIDE, C. P. "BAKER'S ANALYZED"</b>	
Wolf, Jacques & Co., Passaic, N. J.	1212	<b>"CHROMITRON"</b>		Baker, J. T., Chemical Co., Phila.	1095
Amer. Aniline Prod., New York		Kalbfleisch Corporation, New York	1112	<b>CHROMIUM RESINATE</b>	
Holland Aniline Co., Holland, Mich.		<b>CHROMIUM METAL</b>		Klipstein, A., & Co., New York	1143
Melrose Chem. Co., Melrose, Mass.		Harshaw Fuller & Goodwin Co., Cleveland	1127	<b>CHROMIUM SALTS.</b> See under specific heads	
<b>CHROME CEMENT.</b> See Cement, Chrome		Metal & Thermit Corp., New York		<b>CHROMIUM SULFATE</b>	
<b>CHROME CHLORIDE.</b> See Chromium Chloride		<b>CHROMIUM ACETATE</b>		Herrick & Voigt, New York	1129
<b>CHROME COLORS</b>		Daigger, A., & Co., Chicago	428	Klipstein, A., & Company, New York	1145
Butterworth-Judson Corp., New York	1102	Herrick & Voigt, New York	1129	Mutual Chemical Co. of America, New York	1158
National Aniline & Chemical Co., Inc., New York	1159	Klipstein, A., & Co., New York	1111	Powers - Weightman - Rosengarten Co., Philadelphia	1172
Newport Chemical Works, Passaic, N. J.	1164-1165	Lewis, John D., New York	1117	Riker, J. L. & D. S., Inc., New York	1175
<b>CHROME FAST ORANGE A</b>		Will Corporation, Rochester, N. Y.	972-1066	Debrook Co., New York	
Holliday-Kemp Co., New York		Wolf, Jacques & Company, Passaic, N. J.	1212	Innis, Spelden & Co., New York	
<b>CHROME FAST RED B</b>		<b>CHROMIUM CHLORIDE</b>		Leyland, Thos. & Co., Readville, Mass.	
Sherwin-Williams Co., Cleveland		Klipstein, A., & Co., New York	1143	Merrick & Co., New York	
<b>CHROME FAST YELLOW P</b>		<b>CHROMIUM CHROMATE</b>		Monsanto Chem. Wks., St. Louis	
Holliday-Kemp Co., New York		Durfee, Winthrop, Boston		<b>CHROMIUM SULFATE, BASIC</b>	
<b>CHROME GRAY</b>		<b>CHROMIUM FLUORIDE</b>		Riker, J. L. & D. S., Inc., New York	1175
Wolf, Jacques & Co., Passaic, N. J.	1212	Apex Chemical Company, New York	1094	<b>CHROMIUM SULFATE, C. P. "BAKER'S ANALYZED"</b>	
Amer. Aniline Prod., New York		Hub Dyestuff & Chem. Co., Boston		Baker, J. T., Chemical Co., Phila.	1095
Hub Dyestuff & Chemical Co., Boston		Stresen-Reuter & Biser, Chicago		<b>CHROMIUM SULFATE, "KOREON" FOR TANNING</b>	
<b>CHROME GREEN</b>				Mutual Chemical Co. of America, New York	1158
Butterworth-Judson Corp., New York	1102			<b>CHROMOTROP CB</b>	
Althouse Chem. Co., Reading, Pa.				Metz, H. A., & Co., Inc., New York	1154
Chemical Co. of Amer., New York				<b>CHRONOGRAPHS</b>	
<b>CHROME GREEN C</b>				Precision Thermometer & Instrument Co., Philadelphia	784
Newport Chemical Works, Inc., Passaic, N. J.	1164-1165			Will Corporation, Rochester, N. Y.	972-1066
<b>CHROME GREEN CC</b>				Gaertner, Wm., & Co., Chicago	
Metz, H. A., & Co., Inc., New York	1154			<b>CHRONOGRAPHS, LE BOULENGE</b>	
<b>CHROME GREEN G</b>				Precision Thermometer & Instrument Co., Philadelphia	784
Metz, H. A., & Co., Inc., New York	1154			<b>CHRYSAMINE</b>	
<b>CHROME GREEN GN</b>				Althouse Chem. Co., Reading, Pa.	
Calco Chem. Co., Bound Brook, N. J.				Dye Prod. & Chem. Co., New York	
<b>CHROME GREEN N</b>				Smith, J. R., Color Co., Boston	
Newport Chemical Works, Inc., Passaic, N. J.	1164-1165			<b>CHRYSAMINE G</b>	

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CLAY MACHINERY—Con		CLOTH, BOLTING—Con		CLOTH, FILTER, COTTON "META-KLOTH"	
Patterson Foundry & Machine Co., East Liverpool, O.	572-573	Simpson, Orville, Co., Cincinnati	835	Barrell, Wm. L. Co., New York	
Ruggles - Coles Engineering Co., New York	818	Eprout, Waldron, & Co., Muncy, Pa.	848		
Sperry, D. E. & Co., Batavia, Ill.	844-846	Tyler, W. S. Co., Cleveland		<b>CLOTHS, FILTER JACKETS, WOOLEN</b>	
Stroud, E. H. & Co., Chicago	861	<b>CLOTH, BOLTING, "ANCHOR"</b>		Best, Edward H. & Co., Boston	349
Werner & Pfleiderer Co., White Plains, N. Y.	942-943	Latimer, Robert L. & Co., Philadelphia	661	Albany Felt Co., Albany, N. Y.	
Williams Patent Crusher & Pulverizer Co., Chicago	969	<b>CLOTH, BOLTING, "DUFOUR"</b>		<b>CLOTH, FILTER, LINEN</b>	
Amo Clay Mach. Co., Bucyrus, O.		Abbé, Paul O., New York	241-245	Best, Edward H. & Co., Boston	349
Bonnet Co., Canton, O.		Simpson, Orville, Co., Cincinnati	835	Boyle, John, & Co., Inc., New York	363
Crossley Mach. Co., Trenton, N. J.		<b>CLOTH, BOLTING, SILK</b>		Provost Engineering Corp., New York	788
Freese, E. M. Co., Gallion, O.		Abbé Engineering Co., New York	250-254	<b>CLOTH, FILTER, METALLIC</b>	
Internal Clay Mach. Co., Dayton, O.		Abbé, Paul O., New York	241-245	Audubon Wire Cloth Co., Audubon, N. J.	306
Ivory, W. H. & Sons Co., Trenton, N. J.		Latimer, Robert L. & Co., Philadelphia	661	Estey Wire Works Co., New York	470-471
Smidth, F. L. & Co., New York		Simpson, Orville, Co., Cincinnati	845	Latimer, Robert L. & Co., Philadelphia	661
<b>CLAY, SPECIALTIES, VITRIFIED FOR PAPER OR PULP MILLS</b>		Eprout, Waldron, & Co., Muncy, Pa.	848	Ludlow-Saylor Wire Co., St. Louis	672
Winslow & Company, Portland, Me.	1069	Cumbeil, P. F., Phila.		Multi Metal Co., Inc., New York	714
<b>CLEANERS, BOILER TUBE</b>		<b>CLOTH, BOLTING SILK, OLD ANCHOR BRAND</b>		Newark Wire Cloth Co., Newark, N. J.	721
Yarnall-Waring Co., Philadelphia	1079	Latimer, Robert L. & Co., Philadelphia	661	United Filtefs Corporation, Salt Lake City and New York	908-909
Advance Packing Supply Co., Chicago		<b>CLOTH, BOLTING, WIRE. See Cloth Wire</b>		Wickwire Spencer Steel Corp., Worcester, Mass.	970-971
Chester, A. W. Co., Boston		<b>CLOTH, CENTRIFUGAL</b>		Tyler, W. S. Co., Cleveland	
Gem Mfg. Co., Pittsburgh		Audubon Wire Cloth Co., Audubon, N. J.	306	<b>CLOTH, FILTER, SILK</b>	
Godfrey Keeler Co., New York		Multi Metal Co., Inc., New York	714	Best, Edward H. & Co., Boston	349
Huyette, Paul B. Co., Phila.		Newark Wire Cloth Co., Newark, N. J.	721	Boyle, John, & Co., Inc., New York	363
Jarecki Mfg. Co., Erie, Pa.		Provost Engineering Corp., New York	788	Independent Filter Press Co., Brooklyn, N. Y.	585
Lagonda Mfg. Co., Springfield, O.		Wickwire Spencer Steel Corp., Worcester, Mass.	970-971	Latimer, Robert L. & Co., Philadelphia	661
<b>CLEANERS, COAL</b>		Tyler, W. S. Co., Cleveland		United Filters Corporation, Salt Lake City and New York	908-909
Elmore, G. H., Philadelphia	464	<b>CLOTH, CIDER-PRESS</b>		<b>CLOTH, FILTER, WOOL</b>	
Hunt, C. W. & Co., Inc., West New Brighton, N. Y.	582-583	Hooper, W. E. & Sons Co., Philadelphia	570	Best, Edward H. & Co., Boston	349
Jeffrey Manufacturing Co., Columbus, O.	606-607	<b>CLOTH, FILTER</b>		Boyle, John, & Co., Inc., New York	363
Link Belt Company, Chicago	667	Allbright Nell Co., Chicago	260	Huyck, F. C. & Sons, Albany, N. Y.	581
Pennsylvania Crusher Co., Philadelphia	751	Audubon Wire Cloth Co., Audubon, N. J.	306	Independent Filter Press Co., Brooklyn, N. Y.	585
<b>CLEANERS, COAL, "BRADFORD"</b>		Best, Edward H. & Co., Boston	349	Provost Engineering Corp., New York	788
Pennsylvania Crusher Co., Philadelphia	751	Boyle, John, & Co., Inc., New York	363	Albany Felt Co., Albany, N. Y.	
<b>CLEANERS, GRAIN</b>		Estey Wire Works Co., New York	470-471	<b>CLOTH, FILTER, WOOL, "KENWOOD"</b>	
Sprout, Waldron, & Co., Muncy, Pa.	848	Hooper, W. E. & Sons Co., Philadelphia	570	Huyck, F. C. & Sons, Albany, N. Y.	581
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Kennedy Valve Mfg. Co., Elmira, N. Y.	628
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh	766-768
<b>COCKS, CORPORATION</b>	
Union Water Meter Co., Worcester, Mass.	910
<b>COCKS, CURB</b>	
Union Water Meter Co., Worcester, Mass.	910
<b>COCKS, CYLINDER</b>	
Eynon-Evans Corp., Philadelphia	472
<b>COCKS, FILTER-PRESS</b>	
Albright-Nell Co., Chicago	260
Chemical Pump & Valve Co., Perth Amboy, N. J.	396
Sperry, De R., & Co., Batavia, Ill.	844-846
<b>COCKS, FOUR-WAY</b>	
American Steam Gauge & Valve Mfg. Co., Boston	279
Kelly & Jones Company, Greensburg, Pa.	624-625
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh	766-768
Power Piping Co., Pittsburgh	776-777
<b>COCKS, GAUGE</b>	
American Steam Gauge & Valve Mfg. Co., Boston	279
Ashton Valve Company, Cambridge, Mass.	298
Aterite Company, New York	300-301
Crane Co., Chicago	420-421
Eynon-Evans Corp., Philadelphia	472
Jenkins Bros., New York	608-611
Sherwood Mfg. Co., Buffalo	831
<b>COCKS, HYDRAULIC</b>	
Crane Co., Chicago	420-421
Jenkins Bros., New York	608-611
Kelly & Jones Company, Greensburg, Pa.	624-625
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh	766-768
Power Piping Co., Pittsburgh	776-777
Van Atta, E. B., & Company, Inc., Olean, N. Y.	922
Watson-Stillman Co., New York	939
<b>COCKS, INVERTED KEY</b>	
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh	766-768
<b>COCKS, MONEL METAL</b>	
Jenkins Bros., New York	608-611
<b>COCKS, PLUG</b>	
Aterite Company, New York	300-301
Crane Co., Chicago	420-421
Darlon Company, Dayton, O.	450-453
United Lead Company, New York	911-915
<b>COCKS, RUBBER, HARD</b>	
American Hard Rubber Co., New York	268-269
Luzerne Rubber Co., Trenton, N. J.	673
United States Rubber Co., New York	918-919
<b>COCKS, STEAM</b>	
Aterite Company, New York	300-301
<b>COCKS, STONEWARE</b>	
Acid Proof Clay Products Co., Akron, O.	248

The Symbol "S" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12





COKE—Con		PAGE	COKE-OVEN BY-PRODUCT PLANTS		PAGE	COLOR MILLS. See Mills, Color		PAGE
American Metal Company, Ltd., New York			Acme Copper Smelting Co., Chicago		249	<b>COLOR TESTING APPARATUS</b>		
Bethlehem Steel Co., Bethlehem, Pa.			Atlas Car & Mfg. Co., Cleveland		303	Atlas Electric Devices Co., Chicago		304
Birmingham Ry. Light & Power Co., Birmingham, Ala.			Badger, E. B., & Sons Co., Boston		310-329	<b>COLORS, ALKALINE</b>		
Brier Hill Steel Co., Youngstown, O.			Bartlett, Hayward Co., Baltimore		337	National Aniline & Chemical Co., New York		1159
Brockton Gas Light Co., Brockton, Mass.			Buffalo Foundry & Machine Co., Buffalo		374-379	Zinsser & Co., Hastings-on-Hudson, N. Y.		1211
Buffalo Gas Co., Buffalo			Corbett, Geo. E., Boiler & Tank Co., Chicago		416	<b>COLORS, BEVERAGE. See Colors, Confectionery</b>		
By-Products Coke Corp., Chicago			Devine, J. P., Co., Buffalo		436-437	<b>COLORS, BODY</b>		
Calhoun Gas Co., Battle Creek			Groen Mfg. Co., Chicago		538	Harshaw Fuller & Goodwin Co., Cleveland		1127
Cambidge Gas Light Co., Cambridge, Mass.			Hercules Engineering Corp., New York		556-559	<b>COLORS, CEMENT</b>		
Camden Coke Co., Camden, N. J.			Kutztown Foundry & Machine Co., Philadelphia		672-673	Drakenfeld, B. F., & Co., Inc., New York		1115
Central Iron & Coal Co., Holt, Mo.			Lummas, Walter E., Co., Boston		671-681	McMully, Joseph A., New York		1150
Chattanooga Gas & Coal Prod. Co., Chattanooga			Newbold, E. S., & Sons Co., Norristown, Pa.		722	Siegle, G., Corp., of America, Rosebank, S. I., N. Y.		1185
Chattanooga Gas Light Co., Amsterdam, N. Y.			Scott, Ernest & Co., Fall River, Mass.		828	Atlas Mineral Prod. Co., Merz-town, Pa.		
Cleveland Furnace Co., Cleveland			Struthers-Wells Co., Warren, Pa.		864-865	Wachmuth & Lind Chem. Co., Pittsburgh		
Coal Prod. Mfg. Co., Joliet, Ill.			<b>COKE-OVEN MACHINERY</b>			Tsch Bros., New York		
Coal & Coke By-Prod. Co., Pittsburgh			Atlas Car & Mfg. Co., Cleveland		303	<b>COLORS, CERAMIC</b>		
Consolidated Gas Co., New York			Bartlett, Hayward Co., Baltimore		337	Dagger, A., & Co., Chicago		428
Consumers Gas Co., Toronto			Koppers Co., Pittsburgh			Drakenfeld, B. F., & Co., Inc., New York		1115
Deatur Ry. & Light Co., Deatur, Ill.			<b>COKE SCREENING PLANTS</b>			Harshaw Fuller & Goodwin Co., Cleveland		1127
Derby Gas Co., Derby, Conn.			Atlas Car & Mfg. Co., Cleveland		303	Klipstein, A., & Co., New York		1143
Detroit City Gas Co., Detroit			Bartlett, Hayward Co., Baltimore		337	McMully, Joseph A., New York		1150
Dover By-Prod. Coke Co., Dover, Ohio			Koppers Co., Pittsburgh			Roessler & Hasselacher Chemical Co., New York		1179
El Paso Gas Co., El Paso			Wellman-Seaver-Morgan Co., Cleveland			Siegle, G., Corp., of America, Rosebank, S. I., N. Y.		1185
Empire Coal & Coke Co., Geneva, N. Y.			<b>COKE SCREENING PLANTS</b>			Feble Mineral Co., Phila		
Fall River Gas Wks. Co., Fall River, Mass.			Atlas Car & Mfg. Co., Cleveland		303	Hochmeister & Lind Chem. Co., Pittsburgh		
Frick, H. C., Coke Co., Pittsburgh			Bartlett, Hayward Co., Baltimore		337	Mason Color & Chem. Co., New York		
Hamilton-Otto Coke Co., Hamilton, O.			Bartlett, C. O., & Snow Co., Cleveland		338	Sargent, Chas. R., Co., Cleveland		
Holyoke Gas & Elec. Dept., Holyoke, Mass.			Isbell-Porter Co., Newark, N. J.		690	Wiarda, John C., & Co., Bklyn		
Ind. Coke & Gas Co., Terre Haute			Jeffrey Manufacturing Co., Columbus, O.		606-607	<b>COLORS, CERTIFIED FOOD. See Colors, Confectioners'</b>		
Inland Steel Co., Indiana Harbor, Ind.			Link-Belt Company, Chicago		667	<b>COLORS, CHINA. See Colors, Ceramic</b>		
Ky. Solvay Co., Ashland, Ky.			Weller Manufacturing Co., Chicago		914	<b>COLORS, CONFECTIONERS'</b>		
Ky. City Gas Co., Dubuque			Worthington Pump & Machinery Corp., New York		1072-1075	Bush, W. J., & Co., Inc., New York		1101
Laclede Gas Light Co., St. Louis			<b>COLD GLUES. See Glues, Cold</b>			Fries & Fries Co., Cincinnati		1122
Lansing Fuel & Gas Co., Lansing, Mich.			<b>COLD STORAGE INSULATION. See Insulation, Cold Storage</b>			Klipstein, A., & Co., New York		1143
Lehigh Coke Co., S. Bethlehem, Pa.			<b>COLLAPSIBLE TUBE CLOSER AND CLIP FASTENER</b>			National Aniline & Chemical Co., Inc., New York		1159
Lowell Gas Light Co., Lowell, Mass.			Colton, Arthur, Company, Detroit		409	Darwin Chem. Co., Elizabeth, N. J.		
Milwaukee Coke & Gas Co., Milwaukee			<b>COLLAPSIBLE TUBE PASTE-FILLING MACHINES</b>			Heath, Mfg. Co., St. Louis		
New Bedford Gas & Edison Light Co., New Bedford, Mass.			Colton, Arthur, Company, Detroit		409	Henderson, Thos. & Co., New York, N. Y.		
New England Fuel & Trans. Co., Boston			<b>COLLARGOLUM</b>			Kenart Synth. Prod. Co., Chicago		
N. Shore Gas Co., Waukegan, Ill.			Heyden Chemical Co., Garfield, N. J.		1131	Kohnstamm, H., & Co., New York		
N. Liberties Gas Co., Phila			<b>COLLECTORS, DUST. See Dust Collecting Systems</b>			Long & Co., W. H., New York		
Ottawa Gas Co., Ottawa			<b>COLLECTORS, GAS</b>			Magnus, Mabey & Reynard, New York		
Phila. Suburban Gas & Electric Co., Chester, Pa.			Precision Instrument Co., Newark, N. J.		782-783	Orbis Prod. Trading Co., New York		
Providence Gas Light Co., Providence			<b>COLLODINE</b>			Stange Wm J. Co., Chicago		
Quincy Gas, Elec. & Heating Co., Quincy, Ill.			Wolf, Jacques & Company, Passaic, N. J.		1212	<b>COLORS, DEVELOPED. See Dye-stuffs</b>		
Rockford Gas Light Co., Rockford, Ill.			<b>COLLODION</b>			<b>COLORS, DRY</b>		
Seaboard By-Prod. Coke Co., Jersey City			Albany Chemical Company, Albany, N. Y.		1087	American Mineral Products & Color Co., Nobletown, Pa.		1091
Seattle Lighting Co., Seattle			Cooper, Chas., & Co., New York		1111	Binney & Smith Co., New York		1099
Spokane Gas & Fuel Co., Spokane			Du Pont de Nemours, E. I., & Co., Wilmington		1116-1118	Dagger, A., & Co., Chicago		428
Springfield Gas Light Co., Springfield, Mass.			Powers - Weightman - Rosengarten Co., Philadelphia		1172	Drakenfeld, B. F., & Co., New York		1115
Tenn. Coal, Iron & R. R. Co., Fairfield, Ala.			Welsbach Company, Gloucester, N. J.		1210	Harmon Color Works, College Point, N. Y.		1126
United Furnace Co., Canton, O.			Francis Amer. Chem. Wks., Carlstadt, N. J.			Heilmann, Morris & Co., New York		1130
Vancouver Gas Co., Vancouver, B. C.			Hercules Powder Co., Wilmington, N. J.			Klipstein, A., & Co., New York		1143
Youngstown Sheet & Tube Co., Youngstown, O.			Maas & Waldstein Co., Newark, N. J.			McMully, Joseph A., New York		1150
Zenith Furnace Co., West Duluth, Minn.			Seldner & Enequist, Bklyn			Metz, A., & Co., Inc., New York		1154
			Merck & Co., New York			Siegle, G., Corp., of America, Rosebank, S. I., N. Y.		1185
			<b>COLOR MATCHING OUTFITS</b>			Smith Chemical & Color Co., New York		1190
			Atlas Electric Devices Co., Chicago		304	Waldo, E. M. & F., Co., New York		1208
			General Electric Co., Schenectady, N. Y.		508-517	Wolf, Jacques, & Co., Passaic, N. J.		1212
			<b>COLOR STANDARDS</b>			Anchor Color & Gum Wks., Dighton, Mass.		
			LaMotte Chemical Products Co., Baltimore		1144-1145	Anshacher, A. B., & Co., New York		
			Will Corporation, Rochester, N. Y.		972-1066	Atlas Mineral Prod. Co., Merz-town, Pa.		
			<b>COLORIMETERS</b>			Brandram-Henderson, Ltd., Montreal		
			Bausch & Lomb Optical Co., Rochester, N. Y.		340-341	Calif. Ink Co., W. Berkeley, Calif.		
			Brooklyn Thermometer Co., Brooklyn, N. Y.		368	Cambria Paint & Color Co., Johnstown, Pa.		
			Clafin, Geo. L., Co., Providence, R. I.		405	Colours Co., New York		
			Dalger, A., & Co., Chicago		428	Corona Chem. Co., Milwaukee		
			Elmer & Amend, New York		457	Crescent Color & Chem. Wks., New York		
			Glass Specialty Co., Newark, N. J.		523	Eagle Printing Ink Co., New York		
			Marshall Eiel, Inc., Baltimore		692	Eakins, J. S. & W. R., Bklyn.		
			Palo Company, New York		749	Fine Colors Co., Paterson, N. J.		
			Rovey Instrument & Chemical Co., Buffalo		814	Import Chem. Co., New York		
			Scientific Instrument Co., New York		825	Internatl. Color & Chem. Co., Detroit		
			Scientific Utilities Co., Inc., New York		826-827	Jaenecke-Ault Co., Newark, N. J.		
			Standard Scientific Co., New York		852	Kohnstamm, H., & Co., New York		
			Will Corporation, Rochester, N. Y.		972-1066	Lasher & Co., F. G., New York		
			<b>COLORIMETER, "DUBOSCO"</b>					
			Bausch & Lomb Optical Co., Rochester, N. Y.		340-341			
			Will Corporation, Rochester, N. Y.		972-1066			

The Symbol "®" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12



COLORS, DRY—Con	PAGE	COLUMNS, CAST-IRON—Con	PAGE	COMPOUNDS, ACID-PROOFING—	PAGE
Mepharm, Geo. S., & Co., E. St. Louis, Ill.		Mordberg Mfg. Co., Milwaukee...	728-729	Truscon Laboratories, Detroit....	899
Mineral Dye Prod. Ltd., Trenton, Ont.		Reading Iron Co., Reading, Pa.	796-797	Wales Dove-Hermiston Corp., New York	931
Mott Haven Color Wks., New York		Rosedale Foundry & Machine Co., Pittsburgh	812	Warren Chemical Division, New York	936
Muller Color Co., Bklyn		U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.	916-917		
Organic Prod. Corp., Schenectady				COMPOUNDS, ALKALI-RESISTING	
Palmer, G. B. Co., Bklyn		COLUMNS, DISTILLING		Warren Chemical Division, New York	936
Pfeiffer Color Co., New York		Aome Copper Smelting Co., Chicago	249		
Product Sales Co., Baltimore		Badger, E. B., & Sons Co., Boston	310-329	COMPOUNDS, BATTERY SEALING	
Reichard-Coulston, Inc., New York		Buffalo Foundry & Machine Co., Buffalo	374-379	Robertson, H. H., Company, Pittsburgh	806-808
Russ Co., S. Bend Ind.		Detroit Heating & Lighting Co., Detroit	413		
Sargent, Chas. R., Co., Cleveland		Devine, J. P. Co., Buffalo	436-447	COMPOUNDS, BRINE-PROOFING	
Sherwin-Williams Co., Cleveland		Duriron Company, Dayton, O.	450-453	Barber Asphalt Paving Co., Philadelphia	1098
Simon & Elting, New York		Garrigue, William & Company, Chicago and New York	496-501	Horn, A. O., Company, Long Island City, N. Y.	573
Stauffer Chem. Co., San Fran.		Glander & Company, Newark, N. J.	524-525	Lamson, John S., & Bro., New York	1146
Ulrich, Paul, & Co., New York		Groen Mfg. Co., Chicago	538	Master Builders Co., Cleveland	693
Utility Color & Chem. Co., Newark, N. J.		Koppersman, Joseph, & Sons, Philadelphia	630	Robertson, H. H., Company, Pittsburgh	806-808
Whittaker, Clark & Daniels, New York		Lummas, Walter Co., Boston	674-681	Truscon Laboratories, Detroit	899
Whittaker, W. H. Co., New York		Oakland Copper & Brass Works, Oakland, Cal.	732-741	Wales Dove-Hermiston Corp., New York	931
Wilhelm, A., & Co., Reading, Pa.		Oat, Joseph, & Sons, Philadelphia	745	Warren Chemical Division, New York	936
		Ott, George F., Co., Philadelphia	744		
COLORS, DRY, PLANTS		Ross, Chas. A., Inc., New York	810	COMPOUNDS, CASE HARDENING	
Abbé, Paul O., Inc., New York	241-245	Scott, Ernest & Co., Fall River, Mass.	828	Boessler & Hasselacher Chemical Co., New York	1178-1179
Abbé Engineering Co., New York	250-251	Vendome Copper & Brass Works, Louisville, Ky.	923	Baugh & Sons Co., Philadelphia	
Kent Machine Works, Brooklyn, N. Y.	629	Welded Steel Barrel Corp., Detroit	131	Hachmeister-Lind Chem. Co., Pittsburgh	
Patterson Foundry & Machine Co., East Liverpool, O.	752-753			Park Chem. Co., Detroit	
		COLUMNS, FRACTIONATING. See Columns, Distilling		Redman Chem. Co., Verona, Pa.	
COLORS, ENAMEL. See Colors, Ceramic		COLUMNS, RECTIFYING. See Columns, Distilling		Somichorn, L., Sons, New York	
COLORS, FOOD AND BEVERAGES. See Colors, Confectioners'		COLUMNS, WATER, HIGH AND LOW ALARM		COMPOUNDS, "CRATER," GEAR-LUBRICATING	
COLORS, FOOD, "HYGIENIC"		Wright-Austin Co., Detroit	1077	Texas Co., New York	
Bush, W. J., & Co., New York	1101	COMBUSTION APPARATUS, ANALYTICAL		COMPOUNDS, CUTTING AND DRAWING	
COLORS, GLASS. See Colors, Ceramic		Baker & Co., Inc., Newark, N. J.	342	Crescent Oil Company, Indianapolis	
COLORS, LAKE. See Lakes		Bishop, J., & Co., Platinum Works, Midvale, Pa.	356	Dearborn Chem. Co., Chicago	
COLORS, LEATHER FINISHING. See Colors, Dry, and Dyestuffs		Brooklyn Thermometer Co., Brooklyn, N. Y.	368	Fancourt, W. F., & Co., Phila.	
COLORS, OIL. See under name of particular color desired		Clafin, Geo. L., Co., Providence	404	Fiske Bros. Ref. Co., New York	
COLORS, OVER-GLAZE		Dalger, A., & Co., Chicago	478	Lindsay, McMillan & Co., Milwaukee	
Harshaw Fuller & Goodwin Co., Cleveland	1127	Elmer & Amend, New York	457	Moore Oil Co., Cincinnati	
		Electric Heating Apparatus Co., Newark, N. J.	458-459	Oakley Chem. Co., New York	
COLORS, PAINT. See Colors, Dry		Glass Specialty Co., Newark, N. J.	524	Pake & Jones Chem. Co., New York	
COLORS, PAPER MAKERS'. See Colors, Pulp, and Dyestuffs		Hanovia Chemical & Mfg. Co., Newark, N. J.	546	P. Ref. Co., Phila.	
COLORS, PULP		Marshall Richa, Inc., Baltimore	692	Natl. Oil Prod. Co., Harrison, N. J.	
Binney & Smith Co., New York	1099	Mine & Smelter Supply Co., New York	704-705	Sydel Mfg. Co., Jersey City	
Harmon Color Works, College Point, N. Y.	1126	Palo Company, New York	719	Swan & Finch Co., New York	
Heller & Mers Co., New York	1128	Rovey Instrument & Chemical Co., Buffalo	814	Texas Co., New York	
Herrmann, Morris & Co., New York	1130	Scientific Utilities Co., Inc., New York	826-827	COMPOUNDS, DAMP-PROOFING	
McNulty, Joseph A., New York	1140	Standard Calorimeter Co., East Morline, Ill.	849	Barber Asphalt Paving Co., Philadelphia	1098
Siegle, G. Corp., of America, Roseland, N. J.	1185	Standard Scientific Co., New York	852	Horn, A. O., Company, Long Island City, N. Y.	573
Smith Chemical & Color Co., New York	1190	Thermal Syndicate, Ltd., New York	886-889	Master Builders Co., Cleveland	693
Waldo, E. M. & P., New York	1208	Uehling Instrument Co., New York	904	Robertson, H. H., Company, Pittsburgh	806-808
Ansbacher, A. B. & Co., New York		Will Corporation, Rochester, N. Y.	972-1066	Truscon Laboratories, Detroit	899
Childs, C. M., & Co., Bklyn		COMBUSTION APPARATUS, "FAIR"		Wales Dove-Hermiston Corp., New York	931
Crescent Color & Chem. Works, New York		Standard Calorimeter Co., East Morline, Ill.	849	Warren Chemical Division, New York	936
Edkins, J. S. & W. R., Bklyn		Will Corporation, Rochester, N. Y.	972-1066		
Imperial Color Wks., Glens Falls, N. Y.		COMBUSTION BOATS. See Boats, Combustion		COMPOUNDS, IMPREGNATING	
Kohn-Lamm, H., & Co., New York		COMBUSTION, SURFACE, EQUIPMENT		General Bakelite Co., New York	502
Pfeiffer Color Co., New York		Surface Combustion Co., New York	874-875	Lamson, John S., & Bro., New York	1146
Richard-Coulston, Inc., New York		COMBUSTION TUBES. See Tubes, Combustion		Redmanol Chemical Products Co., Chicago	800
Wilhelm, A., & Co., Reading, Pa.		COMMERCIAL YELLOW. See Yellow, Commercial		Robertson, H. H., Company, Pittsburgh	806-808
COLORS, RUBBER MAKERS'. See Colors, Dry		COMPARATORS		Warren Chemical Division, New York	936
COLORS, UNDER-GLAZE		Bausch & Lomb Optical Co., Rochester, N. Y.	340-341	COMPOUNDS, INSULATING	
Harshaw Fuller & Goodwin Co., Cleveland	1127	Eimer & Amend, New York	457	General Bakelite Co., New York	502
		Scientific Utilities Co., New York	826-827	General Electric Co., Schenectady, N. Y.	508-517
COLORS, TEXTILE. See name of particular color desired, also general list under Dyestuffs		Weston Electrical Instrument Co., Newark, N. J.	962	Lamson, John S., & Bro., New York	1146
COLORS, VAT		Will Corporation, Rochester, N. Y.	972-1066	Redmanol Chemical Products Co., Chicago	800
Metz, H. A., & Co., Inc., New York	1154	COMPENSATORS, LOW PRESSURE		Robertson, H. H., Company, Pittsburgh	806-808
Newport Chemical Works, Passaic, N. J.	1164-1165	Isbell-Porter Co., Newark, N. J.	600	Truscon Laboratories, Detroit	899
		COMPOSITION FLOORING. See Flooring, Composition		Warren Chemical Division, New York	936
COLUMBIAN SPIRITS. See Alcohol, Methyl		COMPOUNDERS. See Mixers		COMPOUNDS, LUBRICATING. See Lubricants	
COLUMNS, ABSORBING, ETC. See Towers, Absorbing		COMPOUNDS, ACID-PROOFING		COMPOUNDS, MOLDING	
COLUMNS, CAST-IRON		Barber Asphalt Paving Co., Philadelphia	1098	General Bakelite Co., New York	502
American Car & Foundry Co., New York	264	Horn, A. O., Company, Long Island City, N. Y.	573	General Electric Co., Schenectady, N. Y.	508-517
Buffalo Foundry & Machine Co., Buffalo	374-379	Lamson, John S., & Bro., New York	1146	Redmanol Chemical Products Co., Chicago	800
Clow, James B., & Sons, Chicago	407	Master Builders Co., Cleveland	693	Condensite Co., Bloomfield, N. J.	
Gifford-Wood Co., Hudson, N. Y.	522	Robertson, H. H., Company, Pittsburgh	806-808	COMPOUNDS, PIPE SEAL	
Glamorgan Pipe & Foundry Co., Lynchburg, Va.	520-521			Barber Asphalt Paving Co., Philadelphia	1098
Glander & Company, Newark, N. J.	524-525			Lamson, John S., & Bro., New York	1146
Kutztown Foundry & Machine Co., Philadelphia	652-653			Warren Chemical Division, New York	936
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Robertson, H. M., Company, Pittsburgh	806-808
Truscon Laboratories, Detroit	899
Wallis Dove-Hermiston Corp., New York	931
Warren Chemical Division, New York	936
Chapman Chemical Engineering Co., Inc., New York	
COMPOUNDS, SATURATION	
Robertson, H. M., Company, Pittsburgh	806-808
COMPOUNDS, SCROOPING	
Apex Chemical Co., Inc., New York	1094
COMPOUNDS, STRIPPING	
Apex Chemical Co., Inc., New York	1094
COMPOUNDS, TANK-LINING	
Barber Asphalt Paving Co., Philadelphia	1098
Horn, A. C. Company, Long Island City, N. Y.	573
Robertson, H. M., Company, Pittsburgh	806-808
Wallis Dove-Hermiston Corp., New York	931
Warren Chemical Division, New York	936
COMPOUNDS, WATERPROOFING	
Apex Chemical Co., Inc., New York	1094
Barber Asphalt Paving Co., Philadelphia	1098
Fries & Fries Co., Cincinnati	1122
Horn, A. C. Company, Long Island City, N. Y.	573
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Grinnell Company, Inc., Providence, R. I.	532-536
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American Hard Rubber Co., New York	268-269		Peerless Color Co., Bound Brook, N. J.			Heller & Merz Co., New York	1128	
Belmont Packing & Rubber Co., Philad.	346					Klipstein, A., & Co., New York	1143	
Luzerne Rubber Co., Trenton, N. J.	673		<b>DIRECT BRILLIANT VIOLET B</b>			Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	
Manhattan Rubber Mfg. Co., Passaic, N. J.	690		<b>DIRECT BRILLIANT YELLOW C</b>			Amer. Aniline Prod., New York		
United States Rubber Co., New York	918-919		Calco Chem. Co., Bound Brook, N. J.			Monroe Color & Chem. Co., Quincy, Ill.		
<b>DIPS, LACQUER.</b> See Lacquers Dip			<b>DIRECT BROWN</b>			Smith, J. R., Color Co., Boston		
<b>DIRECT BLACK</b>			Heller & Merz Co., New York	1128		<b>DIRECT GREEN B</b>		
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Metz, H. A., & Co., Inc., New York	1154		Amer. Aniline Prod., New York			Calco Chem. Co., Bound Brook, N. J.		
Amer. Aniline Prod., New York			Indus. Chem. Co., Providence			<b>DIRECT GREEN BXM</b>		
Dicks, David Co., Providence			Wetterwald & Pfister, New York			Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	
Read Holliday & Sons, New York			<b>DIRECT BROWN GC CONC.</b>			<b>DIRECT GREEN G</b>		
Stanley Aniline Chem. Wks., Lock Haven, Pa.			United Chem. Prod. Corp., Jersey City			Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	
Wetterwald & Pfister, New York			<b>DIRECT BROWN GR EXTRA</b>			<b>DIRECT GREEN 2GB</b>		
Williamsburg Chem. Co., Bklyn.			Newport Chemical Works, Inc., Passaic, N. J.	1164-1165		Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	
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<b>DIRECT BLACK EX CONC.</b>			<b>DIRECT BROWN IN</b>			<b>DIRECT GREEN Y</b>		
Calco Chem. Co., Bound Brook, N. J.			Calco Chem. Co., Bound Brook, N. J.			Althouse Chem. Co., Reading, Pa.		
United Chem. Products Corp., Jersey City, N. J.			<b>DIRECT BROWN M</b>			<b>DIRECT GREEN 2Y</b>		
<b>DIRECT BLACK G</b>			Butterworth-Judson Corp., New York	1102		Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	
Butterworth-Judson Corp., New York	1102		<b>DIRECT BROWN E</b>			<b>DIRECT HELIOTROPE B</b>		
<b>DIRECT BLACK 2G</b>			Calco Chem. Co., Bound Brook, N. J.			Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	
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<b>DIRECT BLACK E</b>			Newport Chemical Works, Inc., Passaic, N. J.	1164-1165		Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	
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<b>DIRECT BLACK EW</b>			National Aniline & Chemical Co., Inc., New York	1159		Commonwealth Color & Chem. Co., Bklyn.		
Newport Chemical Works, Inc., Passaic, N. J.	1164-1165		<b>DIRECT DARK BROWN</b>			<b>DIRECT MAROON</b>		
<b>DIRECT BLUE</b>			Calco Chem. Co., Bound Brook, N. J.			Agawam Chem. Wks., Providence		
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Atlantic Dyestuff Co., Boston			<b>DIRECT FAST BROWN</b>			<b>DIRECT NEUTRAL GRAY</b>		
Commonwealth Color & Chem. Co., Bklyn.			Peerless Color Co., Bound Brook, N. J.			Althouse Chem. Co., Reading, Pa.		
Indus. Chem. Co., Providence			<b>DIRECT FAST MAROON RED</b>			<b>DIRECT ORANGE</b>		
Jacksonville Chem. Co., Jacksonville, Fla.			Calco Chem. Co., Bound Brook, N. J.			Heller & Merz Co., New York	1128	
Monroe Color & Chem. Co., Quincy, Ill.			Peerless Color Co., Bound Brook, N. J.			Essex Aniline Wks., Boston		
Read Holliday & Sons, New York			<b>DIRECT FAST ORANGE</b>			<b>DIRECT ORANGE 3G</b>		
Smith, J. R., Color Co., Boston			Althouse Chem. Co., Reading, Pa.			Agawam Chem. Wks., Providence		
Stanley Aniline Chem. Wks., Lock Haven, Pa.			Peerless Color Co., Bound Brook, N. J.			<b>DIRECT ORANGE B</b>		
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Univ. Aniline Dyes & Chem. Co., Milwaukee			Commonwealth Color & Chem. Co., Bklyn.			<b>DIRECT ORANGE 2B</b>		
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Textile-Finishing Machinery Co., Providence	881
DEYERS, TRUCK	
Buckeye Dryer Co., Columbus, O.	372
Drying Systems, Inc., Chicago	448-449
Meade, Richard K., & Co., Baltimore	696
Philadelphia Drying Machinery Co., Philadelphia	763
Proctor & Schwartz, Inc., Philadelphia	787
DEYERS, TUBULAR	
Christie, L. E., Company, Pittsburgh	404
DEYERS, TUNNEL	
Buckeye Dryer Co., Columbus, O.	372
Drying Systems, Inc., Chicago	448-449
Fleischer, W. L., & Co., Inc., New York	480-481
Meade, Richard K., & Co., Baltimore	696
Perry & Webster, Inc., New York	760-761
Philadelphia Drying Machinery Co., Philadelphia	763
Proctor & Schwartz, Inc., Philadelphia	787
DEYERS, TUNNEL TRUCK	
Drying Systems, Inc., Chicago	448-449
Meade, Richard K., & Co., Baltimore	696
Philadelphia Drying Machinery Co., Philadelphia	763
Proctor & Schwartz, Inc., Philadelphia	787
DEYERS, VACUUM	
Allbright-Nell Co., Chicago	260
Badger, E. B., & Sons Co., Boston	310-329
Baker's Sons & Perkins, Jos., Co., White Plains, N. Y.	333
Bartlett, C. O., & Snow Co., Cleveland	338
Brady Jas. A., Foundry Co., Chicago	364
Buffalo Foundry & Machine Co., Buffalo	374-379
Christie, L. E., Company, Pittsburgh	404
Devine, J. P., Company, Buffalo	436-437
Fleischer, W. L., & Co., Inc., New York	480-481
Glander & Company, Newark, N. J.	524-525
Jacoby, Henry E., New York	603
Koven, L. O., & Brother, Jersey City, N. J.	651
Kutztown Foundry & Machine Co., Philadelphia	652-653
Mantius Engineering Co., Inc., New York	688-689
Ott, George F., Co., Philadelphia	744
Roos, Chas. A., Inc., New York	810
Scott, Ernest, & Co., Fall River, Mass.	828
Stokes, F. J., Machine Co., Philadelphia	858-860
Werner & Fleischer Co., White Plains, N. Y.	942-943
DEYERS, VACUUM CHAMBER	
Buffalo Foundry & Machine Co., Buffalo	374-379
Devine, J. P., Company, Buffalo	436-437
Glander & Company, Newark, N. J.	524-525
Kutztown Foundry & Machine Co., Philadelphia	652-653
Rosedale Foundry & Machine Co., Pittsburgh	812
Scott, Ernest, & Co., Fall River, Mass.	828
Wannenwetsch, C. H. A., & Co., Buffalo	

The Symbol "♦" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

DRYERS, AIR	
DRYERS, AIR OR GAS, PRE-HEATED	
Christie, L. R., Company, Pitts-	401
DRYERS, AIR, STEAM HEATED	
American Process Company, New	276
Bartlett, C. O., & Snow Co., Cleve-	338
Bayley Manufacturing Co., Mil-	339
Blaw-Knox Company, Pittsburgh	358-361
Buckeye Dryer Co., Columbus, O.	372
Carrier Engineering Corporation,	386
Christie, L. R., Company, Pitts-	401
Corbett, Geo. E., Boiler & Tank Co.,	416
Devine, J. P., Company, Buffalo	436-437
Fleisher, W. L., & Co., Inc., New	480-481
Glander & Company, Newark, N. J.	524-525
Louisville Drying Machinery Co.,	670
Oldman Boiler Works, Buffalo	710
Perry & Webster, Inc., New York	760-761
Philadelphia Drying Machinery Co.,	763
Prindle, W. E., Co., Columbus, O.	786
Proctor & Schwartz, Inc., Philadel-	787
Ruggles - Coles Engineering Co.,	818
Wagner, J. H., Brooklyn, N. Y.	930
DRYERS, APRON, SECTIONAL AU-TOMATIC	
Philadelphia Drying Machinery Co.,	763

DRYERS, AUTOMATIC	
Aising, J. R., Engineering Co., New	261
Christie, L. R., Company, Pitts-	404
Filtration Engineers, Inc., New	478
Kestner Evaporator Co., Philadel-	632-633
Philadelphia Drying Machinery Co.,	763
Proctor & Schwartz, Inc., Philadel-	787
Ruggles - Coles Engineering Co.,	818
DRYERS, BONE BLACK	
Christie, L. R., Company, Pitts-	401
Kilby Mfg. Co., Cleveland	636
DRYERS, BUHL	
Kestner Evaporator Co., Philadel-	632-633
DRYERS, CENTRIFUGAL. See Cent-	
DRYERS, CHEMICAL	
Filtration Engineers, Inc., New	478
DRYERS, "CHRISTIE"	
Christie, L. R., Company, Pitts-	401
DRYERS, COAL	
Buckeye Dryer Co., Columbus, O.	372
Christie, L. R., Company, Pitts-	401
Elmore, G. H., Philadelphia	464
Fuller-Lehigh Company, Fullerton,	492-493
Link-Belt Company, Chicago	667
Malcolmson Engineering & Machine	687
Meade, Richard K., & Co., Balti-	696
Prindle, W. E., Co., Columbus, O.	786
Ruggles - Coles Engineering Co.,	818
DRYERS, COMPARTMENT	
Aising, J. R., Engineering Co., New	261
Carrier Engineering Corporation,	386
Christie, L. R., Company, Pitts-	401
Devine, J. P., Company, Buffalo	436-437
Drying Systems, Inc., Chicago	448-449
Fleisher, W. L., & Co., Inc., New	480-481
Perry & Webster, Inc., New York	760-761
Wagner, J. H., Brooklyn	930
DRYERS, CONCENTRATING	
Buckeye Dryer Co., Columbus, O.	372
Buffalo Foundry & Machine Co.,	374-379
Carrier Engineering Corporation,	386
Christie, L. R., Company, Pitts-	401
Corbett, Geo. E., Boiler & Tank Co.,	416
Fleisher, W. L., & Co., Inc., New	480-481
Kestner Evaporator Co., Philadel-	632-633
Mantius Engineering Co., Inc.,	688-689
Prindle, W. E., Co., Columbus, O.	786
Ruggles - Coles Engineering Co.,	818
DRYERS, COUNTER-CURRENT	
Aising, J. R., Engineering Co., New	261
American Process Company, New	276
Bartlett, C. O., & Snow Co., Cleve-	338
Buckeye Dryer Co., Columbus, O.	372
Christie, L. R., Company, Pitts-	401
Louisville Drying Machinery Co.,	670
Malcolmson Engineering & Machine	687
Prindle, W. E., Co., Columbus, O.	786
Ruggles - Coles Engineering Co.,	818
DRYERS, DIRECT HEAT	
Aising, J. R., Engineering Co., New	261
American Process Company, New	276
Bartlett, C. O., & Snow Co., Cleve-	338
Blaw-Knox Company, Pittsburgh	358-361
Buckeye Dryer Co., Columbus, O.	372
Christie, L. R., Company, Pitts-	401
Coatesville Boiler Works, Coates-	408
Corbett, Geo. E., Boiler & Tank Co.,	416
Devine, J. P., Company, Buffalo	436-437

DRYERS, DIRECT HEAT-Con.	
Glander & Company, Newark, N. J.	524-525
Kellogg, M. W., Co., New York	622-623
Louisville Drying Machinery Co.,	670
Malcolmson Engineering & Machine	687
Mantius Engineering Co., Inc., New	688-689
Meade, Richard K., & Co., Balti-	696
Perry & Webster, Inc., New York	760-761
Prindle, W. E., Co., Columbus, O.	786
Ruggles - Coles Engineering Co.,	818
DRYERS, DOUBLE SHELL	
Malcolmson Engineering & Machine	687
Ruggles - Coles Engineering Co.,	818
DRYERS, DRUM	
Allbright-Nell Co., Chicago	260
American Welding Co., Carbondale,	285
Brady, Jas. A., Foundry Co., Chi-	364
Buckeye Dryer Co., Columbus, O.	372
Buffalo Foundry & Machine Co.,	374-379
Christie, L. R., Company, Pitts-	401
Consolidated Products Co., New	411
Devine, J. P., Company, Buffalo	436-437
Glander & Company, Newark, N. J.	524-525
Kellogg, M. W., Co., New York	622-623
Mantius Engineering Co., Inc., New	688-689
Prindle, W. E., Co., Columbus, O.	786
Ruggles - Coles Engineering Co.,	818
Scott, Ernest, & Co., Fall River,	828
Stokes, F. J., Machine Co., Phila-	858-860
DRYERS, DRUM, FORGE-WELDED	
American Welding Co., Carbondale,	285
Kellogg, M. W., Co., New York	622-623
DRYERS, DRUM, DUSTLESS (FOR PRECIPITATES)	
Christie, L. R., Company, Pitts-	401
DRYERS, ELECTRIC	
General Electric Co., Schenectady,	608-517
Westinghouse Electric & Mfg. Co.,	946-961
DRYERS, FAN SYSTEM	
Buffalo Forge Co., Buffalo	373
DRYERS, FEED	
Prindle, W. E., Co., Columbus, O.	786
DRYERS, FERTILIZER	
Prindle, W. E., Co., Columbus, O.	786
DRYERS, GARBAGE	
Prindle, W. E., Co., Columbus, O.	786
DRYERS, GRAIN	
Christie, L. R., Company, Pitts-	401
Prindle, W. E., Co., Columbus, O.	786
Sprout, Waldron, & Co., Muncy, Pa.	848
Weller Manufacturing Co., Chicago	941
DRYERS, "HULLARD"	
Lake Shore Eng. Wks., Mar-	quette, Mich.
DRYERS, "HURRICANE"	
Philadelphia Drying Machinery Co.,	763
DRYERS, INDIRECT HEAT	
Aising, J. R., Engineering Co., New	261
Bartlett, C. O., & Snow Co., Cleve-	338
Blaw-Knox Company, Pittsburgh	358-361
Buckeye Dryer Co., Columbus, O.	372
Carrier Engineering Corporation,	386
Christie, L. R., Company, Pitts-	401
Corbett, Geo. E., Boiler & Tank Co.,	416
Devine, J. P., Company, Buffalo	436-437
Drying Systems, Inc., Chicago	448-449
Fleisher, W. L., & Co., Inc., New	480-481
Fuller-Lehigh Company, Fullerton,	492-493
Glander & Company, Newark, N. J.	524-525
Kestner Evaporator Co., Philadel-	632-633
Louisville Drying Machinery Co.,	670
Malcolmson Engineering & Machine	687
Mantius Engineering Co., Inc., New	688-689
Meade, Richard K., & Co., Balti-	696
Oldman Boiler Works, Buffalo	740
Perry & Webster, Inc., New York	760-761

Mentioning this catalog when writing firms enables us to give you a better reference work next year.  
For List of Scientific and Technical Books, see page 1215

## DYESTUFFS—Con.

Atlantamine Brown 2G  
Atlantamine Green 2G  
Atlantamine Green J  
Atlantamine Red 4E  
Atlantamine Yellow C  
Atlantene Developed Black  
Atlantene Chrome Yellow BG  
Atlantic Sulfur Black B Extra  
Atlantic Sulfur Black G Extra  
Atlantic Sulfur Black E Extra  
Atlantic Sulfur Blue B Ex. Conc.  
Atlantic Sulfur Blue E  
Atlantic Sulfur Brown R  
Atlantic Sulfur Maroon  
Atlantic Sulfur Sky Blue  
Atlantic Sulfur Yellow G  
Atlantic Sulfur Yellow GR  
Atlantole Acid Black 10B  
Atlantole Acid Black 10B Conc.  
Atlantole Acid Red AF  
Auramine  
Autol Red  
Azo Yellow  
Azocosine G  
Azofuchsine  
Azorubine  
Azoiline Red  
Basic Black  
Basic Blue  
Basic Blue, Bright  
Basic Brown  
Basic Orange  
Basic Purple  
Benzosaurine G Extra  
Benzo Blue  
Benzopurpurine 4B  
Benzopurpurine 10B  
Biebrich Acid Blue DS  
Bismarck Brown E  
Bismarck Brown Y  
Bordeaux  
Bordeaux B  
Brazil Brown  
Brilliant Crimson No. 10  
Brilliant Green  
Brilliant New Cotton Yellow L Conc.  
Brilliant Orange  
Brilliant Red  
Brilliant Scarlet  
Brilliant Scarlet 3E  
Brilliant Sulfur Blue  
Brilliant Yellow  
Bromo Fluorescein  
Broom Green  
Burmah Red  
Carmoisine  
Centraline Black BH  
Centraline Blue 2B  
Centraline Blue 3B  
Centraline Fast Red F  
Centraline Violet N  
Chrome Black  
Chrome Black A  
Chrome Black FF  
Chrome Blue  
Chrome Blue G Extra  
Chrome Blue-Black  
Chrome Blue-Black Y  
Chrome Blue-Black V Conc.  
Chrome Bordeaux  
Chrome Brown  
Chrome Brown 3G  
Chrome Fast Brown W  
Chrome Fast Orange A  
Chrome Fast Red B  
Chrome Fast Yellow P  
Chrome Gray  
Chrome Green  
Chrome Green C  
Chrome Green CC  
Chrome Green G  
Chrome Green GN  
Chrome Green N  
Chrome Orange GG  
Chrome Orange R  
Chrome Phosphine SW  
Chrome Red  
Chrome Red A4B  
Chrome Scarlet  
Chrome Violet  
Chrome Yellow  
Chrome Yellow G  
Chrome Yellow 3G  
Chrome Yellow 5G  
Chrome Yellow 2E  
Chrysamine  
Chrysamine G  
Chrysoidine  
Chrysoine  
Chrysophenine  
Chrysophenine Extra  
Chrysophenine Extra, Triple  
Claret Red E  
Coeruleine  
Congo Blue  
Congo Corinth  
Congo Red  
Congo Red 4B  
Coralline Red  
Cosmic Black  
Cotton Blue 2B  
Croceine Orange E

## DYESTUFFS—Con.

Croceine Scarlet  
Crystal Violet  
Crystal Violet 3B  
Dolphine Blue  
Developed Black  
Developed Black BH  
Developed Black 2BH  
Developed Black 5C  
Diamine Blue  
Diamine Blue 3E  
Diamine Bordeaux  
Diamine Green  
Diaz Black ES  
Diaz Seal Brown  
Direct Black  
Direct Black BH  
Direct Black Ex. Conc.  
Direct Black 2E Extra Conc.  
Direct Black G  
Direct Black 2G  
Direct Black E  
Direct Black BW  
Direct Blue  
Direct Blue 2B  
Direct Blue 2B Conc.  
Direct Blue 3B  
Direct Blue 2BO  
Direct Blue BX  
Direct Blue 2BX Conc.  
Direct Blue EXG  
Direct Blue H2G  
Direct Bordeaux B2S  
Direct Bright Fast Blue B  
Direct Brilliant Blue G  
Direct Brilliant Pink  
Direct Brilliant Rose B Extra  
Conc.  
Direct Brilliant Violet E  
Direct Brilliant Yellow C  
Direct Brown  
Direct Brown GC Conc.  
Direct Brown GR Extra  
Direct Brown GK  
Direct Brown GKR  
Direct Brown IN  
Direct Brown M  
Direct Brown RB  
Direct Brown T  
Direct Dark Brown  
Direct Dark Green C  
Direct Fast Blue BW  
Direct Fast Brown  
Direct Fast Maroon Red  
Direct Fast Orange  
Direct Fast Orange G  
Direct Fast Pink  
Direct Fast Red  
Direct Fast Red F  
Direct Fast Red R  
Direct Fast Rose  
Direct Fast Scarlet  
Direct Fast Scarlet 6BX  
Direct Fast Violet 4B  
Direct Fast Yellow  
Direct Fast Yellow NN  
Direct Garnet  
Direct Gray  
Direct Green  
Direct Green B  
Direct Green BXM  
Direct Green G  
Direct Green 2GB  
Direct Green GXM  
Direct Green J  
Direct Green Y  
Direct Green 2Y  
Direct Heliotrope B  
Direct Khaki  
Direct Maroon  
Direct Navy Blue  
Direct Neutral Gray  
Direct Orange  
Direct Orange 3G  
Direct Orange E  
Direct Orange 2E  
Direct Orange 2RG  
Direct Pink 2B  
Direct Red  
Direct Red F  
Direct Red Y  
Direct Rose  
Direct Salmon B  
Direct Salmon Red  
Direct Scarlet  
Direct Seal Brown  
Direct Sky Blue  
Direct Sky Blue 6B  
Direct Sky Blue PP  
Direct Steel Blue G  
Direct Violet  
Direct Violet N  
Direct Violet E  
Direct Yellow  
Direct Yellow CJ  
Direct Yellow DG  
Direct Yellow G  
Direct Yellow GK  
Direct Yellow E  
Direct Yellow SW  
Egg Color  
Empire Acid Black  
Empire Acid Bordeaux  
Empire Acid Maroon

## DYESTUFFS—Con.

Empire Acid Orange  
Empire Acid Red  
Empire Acid Scarlet  
Empire Acid Violet 4BN  
Empire Acid Violet 520  
Empire Brilliant Green  
Empire Brilliant Yellow  
Empire Dark Blue  
Empire Dark Green  
Empire Fast Red  
Eosine  
Eosine Red  
Erie Black  
Erie Brown  
Erie Orange 2B  
Erythrine  
Erythrosine  
Essex Chrome Green B Conc.  
Essex Chrysophenine  
Essex Direct Brilliant Pink SX  
Essex Direct Brown D3G  
Essex Direct Brown R  
Essex Direct Brown 2E  
Essex Direct Brown RN  
Essex Direct Brown Y  
Essex Direct Brown 2Y  
Essex Direct Fast Scarlet B  
Essex Direct Orange R  
Essex Direct Orange 2RE  
Essex Direct Orange 3RE  
Essex Direct Orange 4RE  
Essex Direct Orange 5RE  
Essex Direct Pink NY  
Essex Direct Pink 2Y  
Essex Direct Rose NB  
Essex Direct Rose FFB  
Essex Direct Yellow CF  
Essex Direct Yellow 2G  
Essex Teramine GB  
Fast Acid Blue GG  
Fast Acid Orange 2G  
Fast Acid Red C2B  
Fast Acid Violet 10B  
Fast Black V  
Fast Black VC  
Fast Blue  
Fast Brown G  
Fast Crimson  
Fast Egyptian  
Fast Gray  
Fast Green  
Fast Leather Brown BR  
Fast Leather Red LS  
Fast Leather Yellow LF  
Fast Light Yellow 3G  
Fast Pigment Black  
Fast Ponceau Orange  
Fast Red  
Fast Red A  
Fast Red GB Extra  
Fast Red SB Extra  
Fast Red SBT  
Fast Red T Extra  
Fast Silk Gray M  
Fast Steam Black  
Fast Steam Gray  
Fast Violet  
Fast Yellow  
Flaming Red B  
Flaming Red 5B  
Flaming Red 10B  
Fuchsine  
Fuchsine E  
Fur Black  
Fur Blue  
Fur Brown  
Galloyanine  
Gendarme Blue  
Gobelin Blue  
Graphic Red Y & E  
Indigotine A  
Indigotine B Conc.  
Indigotine C  
Indophenine Blue  
Induline Blue  
Induline Oil Sol.  
Induline Spirit Sol.  
Induline Water Sol.  
Lake Red C  
Lanacyl Violet M  
Lanafuchsine  
Lanafuchsine B  
London Blue  
Magenta B  
Malachite Green  
Maracabo Brown  
Marine Blue SW  
Meldola Blue 3E  
Metanil Yellow  
Methyl Violet  
Methyl Violet 2B  
Methyl Violet 3B  
Methyl Violet 4B New  
Methyl Violet 5B Conc.  
Methyl Violet 4BN  
Methylene Blue  
Methylene Blue 2B  
Methylene Blue 4B  
Methylene Gray  
Methylene Gray E  
Methylene Gray R  
Methylene Green  
Methylene Violet

The Symbol "®" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

## DYE STUFFS—Con.

Midland Blue B  
Milling Blue 2B  
Milling Yellow PO  
Mordant Green 2G  
Naphthol B. Black  
Naphthol Blue  
Naphthol Blue B  
Naphthol Blue E  
Naphthol Green  
Naphthol Yellow  
Naphthol Yellow S  
Naphthylamine Red  
Navy Blue G  
Navy Blue E  
Navy Blue for Wool  
Neutral Gray G  
New Brilliant Cotton Yellow L  
Conc.  
Nigrosine Blue Oil Sol.  
Nigrosine Blue Spirit Sol.  
Nigrosine Blue Water Sol.  
Nigrosine Jet Oil Sol.  
Nigrosine Jet Spirit Sol.  
Nigrosine Jet Water Sol.  
Oil Black  
Oil Black Walnut  
Oil Blue  
Oil Blue B  
Oil Brown  
Oil Cherry  
Oil Green  
Oil Mahogany Red  
Oil Orange  
Oil Orange Extra  
Oil Pink  
Oil Red  
Oil Scarlet  
Oil Violet  
Oil Walnut  
Oil Yellow  
Opal Blue  
Orange A  
Orange GG  
Orange GGE  
Orange I  
Orange II  
Orange Y  
Ortho-Cyanine B  
Ortho-Cyanine E  
Oxamine Violet Blue  
Pacoco Direct Brown C  
Pacoco Direct Brown M  
Pacoco Direct Fast Red F  
Pacoco Direct Green  
Pacoco Direct Gray  
Palachrome Blue G  
Palachrome Green G  
Palaside Black  
Palaside Blue G  
Palaside Blue E  
Palaside Brown B  
Palaside Green  
Patent Blue A  
Patent Blue V  
Permanent Red 4B  
Permanent Red E  
Pheno Black  
Pheno Blue  
Pheno Brown  
Pheno Green  
Pheno Orange  
Pheno Violet  
Pheno Yellow  
Phloxine  
Pigment Scarlet 3B  
Plum GG  
Ponceau 2G  
Ponceau 5E  
Ponceau Scarlet  
Potting Black CG  
Primazol Moss  
Primuline  
Primuline Extra Conc.  
Primuline SF (Developed)  
Primuline Superior (Developed)  
Pyrazol Orange G  
Quinoline Yellow  
Rajah Red  
Raspberry Red  
Resorcin Brown  
Rhodamine  
Rhodamine B Extra  
Rhodamine 6G Extra  
Roccelline  
Rodol A  
Rodol D  
Rodol DB  
Rodol DG  
Rodol 2G  
Rodol 4G  
Rodol 5A  
Rodol X  
Rodol Gray B  
Rodol Gray CD  
Rodol Gray E  
Rose Bengal  
Safranin  
Safranin Y  
Sap Brown  
Scarlet 2E  
Scarlet 2EG  
Scarlet 2EH

## DYE STUFFS—Con.

Scarlet 3E  
Serichrome Blue B  
Serichrome Green B  
Soluble Blue (Coal-tar Color)  
Soluble Blue for Ink  
Soluble Blue 2B  
Soluble Blue E  
Soluble Blue 2E  
Soluble Blue 2G  
Spirit Blue  
Steam Black  
Steam Blue  
Sudan I  
Sulfur Black  
Sulfur Black A  
Sulfur Blue  
Sulfur Blue 3B  
Sulfur Blue BCG Conc.  
Sulfur Blue BCG Conc.  
Sulfur Blue BCG Ex. Conc.  
Sulfur Blue 4BX Conc.  
Sulfur Blue BX  
Sulfur Blue BXXG  
Sulfur Brown  
Sulfur Brown C3E  
Sulfur Brown 2F  
Sulfur Brown X  
Sulfur Brown E  
Sulfur Cutch E  
Sulfur Drab, Hydro V  
Sulfur Fast Yellow G  
Sulfur Green  
Sulfur Green Conc.  
Sulfur Green BCG  
Sulfur Green DGB  
Sulfur Green G  
Sulfur Green G Conc.  
Sulfur Indigo Blue E  
Sulfur Indone 3E  
Sulfur Indone 2E  
Sulfur Khaki  
Sulfur Maroon E  
Sulfur Navy Blue  
Sulfur Olive  
Sulfur Olive O  
Sulfur Olive OD  
Sulfur Orange Brown  
Sulfur Sky Blue  
Sulfur Tan Conc.  
Sulfur Yellow  
Sulfur Yellow E  
Sulfur Red  
Table Black  
Tangier Orange  
Tartrazine  
Tartrazine BX  
Tartrazine XXX  
Tokio Orange  
Toluylene Brown  
Union Blue PB  
Union Blue PE  
Union Yellow PFF  
Uranine  
Victoria Blue B  
Victoria Green  
Victoria Red  
Victoria Scarlet 3E  
Victoria Violet  
Victoria Violet 4BS  
Violamine B  
Violamine E  
Violamine EB  
Wash Blue  
Wool Black  
Wool Black E  
Wool Black G Conc.  
Wool Blue GX  
Wool Claret  
Wool Fast Green BS  
Wool Fast Violet 4E Extra  
Wool Green E  
Wool Green S Conc.  
Wool Orange  
Wool Scarlet 2E  
Wool Violet ES  
Wright's Brilliant Sulfur Blue B  
Xylidene Scarlet

## DYE STUFFS

American Dyewood Co., New York  
Butterworth-Judson Corp., New York  
Chaplain & Bibbo, New York  
Dow Chemical Co., Midland, Mich.  
Du Pont de Nemours, E. I., & Co., Wilmington, Del.  
Gaskill Chemical Corp., Brooklyn  
Grasselli Chemical Co., Cleveland  
Heller & Herz Co., New York  
Kilpstein, A. & Co., New York  
Metz, H. A., & Co., Inc., New York  
National Aniline & Chemical Co., Inc., New York  
Newport Chemical Works, Inc., Passaic, N. J.  
Tower Manufacturing Co., Inc., New York  
Wolf, Jacques, & Company, Passaic, N. J.  
Zinsser & Co., Hastings, N. Y.  
Agawam Chem. Wks., Providence

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## DYE STUFFS—Con.

Althouse Chem. Co., Reading, Pa.  
Amalgamated Dyestuff & Chem. Wks., New York  
Amer. Aniline Prod., New York  
Amer. Synthetic Color Co., Stamford, Conn.  
Amer. Synthetic Dyes, Newark, N. J.  
Atlantic Dyestuff Co., Boston, Mass.  
Atlas Color Wks., Bklyn.  
Bachmeyer & Co., New York  
Beaver Chem. Co., Damascus, Va.  
Calif. Ink Co., W. Berkeley, Calif.  
Campbell, John & Co., New York, N. Y.  
Central Dyestuff & Chem. Co., Newark, N. J.  
Chem. Prod. Corp., Milwaukee  
Chrome Color Wks., Matawan, N. J.  
Cotton Chem. Co., Dundee Lake, N. J.  
Color Service Corp., New York  
Commonwealth Color & Chem. Co., Bklyn.  
Conn. Metal & Chem. Co., Berlin, Ct.  
Cooks, Falls, Dye Wks., Cooks Falls, N. Y.  
Cosmos Chem. Co., Plainfield, N. J.  
Dye Prod. & Chem. Co., New York  
Essex Aniline Wks., Boston  
Fergusson, Alex. C., Jr., Phila.  
Garfield Aniline Wks., Garfield, N. J.  
Genl. Supply Co., Perth Amboy, N. J.  
Heald, Jno. H., & Co., Inc., Lynchburg, Va.  
Heath Mfg. Co., St. Louis  
Holland Aniline Co., Holland, Mich.  
Holladay Kemp Co., New York  
Hub Dyestuff & Chem. Co., Boston  
Hydrocarbon Chem. Prod. Co., Lancaster, Pa.  
Indus. Chem. Co., Providence  
Kount South Prod. Co., Chicago  
King Chem. Co., New York  
Long & Co., W. H., New York  
May Chemical Works, Newark, N. J.  
Miller, Wm. T., Aniline & Chem. Co., Bklyn.  
Mineral Dye Prod., Trenton  
Monroe Color & Chem. Co., Quincy, Ill.  
N. Y. Color & Chem. Co., New York  
Noel Chem. & Color Wks., New York  
Oakden Mfg. Co., Long Island City, N. Y.  
Obex Co., Marietta, Ohio  
Organic Prod. Corp., Schenectady  
Palatine Aniline & Chem. Corp., Boston  
Peerless Color Co., Bound Brook, N. J.  
Pharma Chem. Corp., New York  
Radiant Dye & Color Wks., Bklyn.  
Reliance Aniline & Chem. Co., New York  
Rowayton Aniline Wks., Rowayton, Conn.  
Schaper Chem. Co., Chicago  
Seydel Mfg. Co., Jersey City  
Sherwin-Williams Co., Cleveland  
Staler Chem. Co., New York  
Stamford Extract Mfg. Co., Stamford, Conn.  
Stanley Aniline Chem. Wks., Lock Haven, Pa.  
Sterling Color Co., New York  
Taylor-White Extracting Co., Camden, N. J.  
Trico Chem. Co., Buffalo  
Ultron Chem. Corp., New York  
United Chem. Prod. Corp., Jersey City  
United Indigo & Chem. Co., Boston  
U. S. Color & Chemical Co., Boston  
Univ. Aniline Dyes & Chem. Co., Milwaukee  
Wattmeyer & Pfister, New York  
White Tar Aniline Corp., New York  
Widder Bros., Bklyn.  
Williamshurg Chem. Co., Bklyn.  
Wright Chem. Corp., New York  
Young, J. S., & Co., Hanover, Pa.  
Zobel Co., Ernest, New York

## DYE STUFFS, ACRIDINE

Heyl Laboratories, New York.... 1132

Mentioning this catalog when writing firms enables us to give you a better reference work next year.  
For List of Scientific and Technical Books, see page 1215



DYESTUFFS, BACTERIOLOGICAL		EDISON ELECTRIC SAFETY MINE LAMPS.		ELECTROCHEMICAL PROCESSES, EQUIPMENT FOR—Con.	
Keyl Laboratories, New York	1132	Electric Safety Mine		Green, Saml. M., Co., Springfield, Mass.	
LaMotte Chemical Products Co., Baltimore	1144-1145	EDUCTORS, WATER JET		Process Engineers, New York	
Will Corporation, Rochester, N. Y.	972-1066	Schutte & Koerting Co., Philadelphia	822-823	ELECTRODES, ARC WELDING	
DYESTUFFS, INDICATOR		EGG COLOR		Wilson Welder & Metals Co., Brooklyn, N. Y.	1067
Alizarin		Chaplain & Bibbo, New York	1106	ELECTRODES, BRASS	
Alpha-Naphtholbenzene		"EGGCRATE" GRATING-FLOORING		Wilson Welder & Metals Co., Brooklyn, N. Y.	1067
Alpha-Naphthylamine		Irving Iron Works Co., Long Island City, N. Y.	598-599	ELECTRODES, BRONZE	
Azolitmin		EGG YOLK		Wilson Welder & Metals Co., Brooklyn, N. Y.	1067
Benoxypurpurine		Jardine, Matheson & Co., New York	1140	ELECTRODES, CARBON	
Brilliant Green		Kilpstein, A. & Co., New York	1143	Acheson Graphite Co., Niagara Falls	247
Bromocresol Purple		Frost, F. W., & Co., New York		Can. Electrode Co., Shawinigan Falls, P. Q.	
Bromophenol Blue		Innk, Spelden, & Co., New York		Natl. Carbon Co., Cleveland	
Bromothymol Blue		Taylor, Geo. P., Commission Co., New York		Pure Carbon Co., Wellsville, N. Y.	
Carminic Acid		EGG YOLK, DRY		Republic Carbon Co., Niagara Falls	
Congo Red		Jardine, Matheson & Co., New York	1140	Speer Carbon Co., St. Marys, Pa.	
Coralline		EGGS, ACID. See Acid Eggs		ELECTRODES, CAST-IRON	
Cresol Blue		EJECTORS		Wilson Welder & Metals Co., Brooklyn, N. Y.	1067
Cresolphthalein		Acid Proof Clay Products Co., Akron	248	ELECTRODES, CAST STEEL	
Cresol Red		Duriron Company, Dayton, O.	450-453	Wilson Welder & Metals Co., Brooklyn, N. Y.	1067
Crystal Violet		Eynon-Evans Corp., Philadelphia	472	ELECTRODES, COPPER	
Dibromocresolsulfonaphthalein		General Ceramics Co., New York	504-507	Wilson Welder & Metals Co., Brooklyn, N. Y.	1067
Dimethylaminoazobenzene		Knight, Maurice A., East Akron, O.	638-649	ELECTRODES, GRAPHITE	
Dimethylaminoazobenzaldehyde		Schutte & Koerting Co., Philadelphia	822-823	Acheson Graphite Co., Niagara Falls	247
Dimethylglyoxime		Sherwood Manufacturing Co., Buffalo	831	Pure Carbon Co., Wellsville, N. Y.	
Diphenylamine		Watson & McDaniel Co., Philadelphia	938	Republic Carbon Co., Niagara Falls	
Diphenylaminazobenzene		Chaplin-Pulton Mfg. Co., Pittsburgh		Speer Carbon Co., St. Marys, Pa.	
Eosine		Cornell, W. G. Co., New York		ELECTRODES, GRAPHITE WELDING	
Ethyl Orange		Nason Mfg. Co., New York		Acheson Graphite Co., Niagara Falls	247
Fluorescein		Perkins, B. F. Co., Holyoke		ELECTRODES, MALLEABLE IRON	
Fuchsine, Acid		EJECTORS, ACID		Wilson Welder & Metals Co., Brooklyn, N. Y.	1067
Fuchsine, Basic		Acid Proof Clay Products Co., Akron	248	ELECTRODES, PLATINUM	
Indigotine		Duriron Company, Dayton, O.	450-453	American Platinum Works, Newark, N. J.	275
Iodososine		General Ceramics Co., New York	504-507	Baker & Co., Inc., Newark, N. J.	332
Meta-Dinitrobenzoyle Urea		Knight, Maurice A., East Akron, O.	638-649	Bishop, J., & Co., Platinium Works, Malvern, Pa.	356
Methyl Orange		Schutte & Koerting Co., Philadelphia	822-823	Brooklyn Thermometer Co., Brooklyn, N. Y.	368
Methyl Red		Sherwood Manufacturing Co., Buffalo	831	Clafin, Geo. L., Co., Providence	405
Methyl Violet		ELASTIC PAPER LININGS FOR BARRELS, ETC.		Elmer & Amend, New York	457
Methylene Blue		Arkell Safety Bag Co., New York		Glass Specialty Co., Newark, N. J.	523
Mutal Red		Gab, Robert Co., New York		Johnson, Matthew, & Co., New York	611
Ortho-Carboxybenzenesazodimethyl-aniline		ELASTIC WEB FINISHING MACHINERY		Marshall Bieha, Inc., Baltimore	692
Ortho-Cresolsulfonaphthalein		Textile-Finishing Machinery Co., Providence	884	Mine & Smelter Supply Co., New York	704-705
Para-Nitrophenol		ELASTOL		Palo Company, New York	749
Phenacetolin		Rhodla Chemical Company, New York	1174	Rovey Instrument & Chemical Co., Buffalo	814
Phenol Red		ELBOWS. See Fittings		Scientific Utilities Co., New York	826-827
Phenolphthalein		ELECTRIC BACK GEARED WINCHES. See Winches, Electric and Hand		Standard Scientific Co., New York	852
Phenolsulfonaphthalein		ELECTRIC EQUIPMENT. See under specific heads		Will Corporation, Rochester, N. Y.	972-1066
Phenylhydrazine		ELECTRIC GENERATING SETS. See Generators		ELECTRODES, STEEL	
Porter's Blue		ELECTRIC HEATING APPARATUS		Wilson Welder & Metals Co., Brooklyn, N. Y.	1067
Rosocincol Blue		Ajax Electrothermic Corp., Trenton, N. J.	257	ELECTRODES, TUNGSTEN	
Rosolic Acid		Elmer & Amend, New York	457	Fansteel Prod. Co., Chicago, Ill.	
Tetrabromophenolsulfonaphthalein		Electric Heating Apparatus Co., Newark, N. J.	458-459	ELECTRODES, WELDING	
Thymol Blue, Acid		General Electric Co., Schenectady	508-517	Wilson Welder & Metals Co., Brooklyn, N. Y.	1067
Thymol Blue, Alkaline		Hoskins Mfg. Co., Detroit	574-575	ELECTRODES, WROUGHT IRON	
Thymolphthalein		Westinghouse Electric & Mfg. Co., East Pittsburgh	946-961	Wilson Welder & Metals Co., Brooklyn, N. Y.	1067
Thymolsulfonaphthalein, Acid		Will Corporation, Rochester, N. Y.	972-1066	ELECTRODYNAMOMETERS	
Tolylene Red		ELECTRIC HOISTS. See Hoists, Electric		Pyroelectric Instrument Co., Trenton, N. J.	790
Tropaeolin		ELECTRICAL INSULATION MATERIAL		Weston Electrical Instrument Co., Newark, N. J.	962
DYESTUFFS, INDICATOR, CRYSTALLIZED		General Bakelite Co., New York	502	"ELECTROLABS" OXYGEN AND HYDROGEN APPARATUS	
Keyl Laboratories, New York	1132	General Electric Company, Schenectady	508-517	Electrolabs Company, Pittsburgh	461
LaMotte Chemical Products Co., Baltimore	1144-1145	Redman Chemical Products Co., Chicago	800	"ELECTROLON"	
Synthetic Laboratories of Chicago, Chicago	1191	Westinghouse Electric & Manufacturing Co., East Pittsburgh	946-961	Abrasives Co., Phila.	
Will Corporation, Rochester, N. Y.	972-1066	ELECTROCHEMICAL POWER PLANTS. See Power Plants		ELECTROLYTE. See Acid, Electrolyte	
Hayson, Westcott & Dunning, Baltimore		ELECTROCHEMICAL PROCESSES, EQUIPMENT FOR. See also under specific heads		ELECTROLYTIC APPARATUS, ACID-PROOF	
DYESTUFFS, LITHOGRAPHIC		Bleach Process Company, Appleton, Wis.	357	Acid Proof Clay Products Co., Akron, O.	248
Keyl Laboratories, New York	1132	Electrochemical Supply & Engineering Co., Philadelphia	460	General Ceramics Company, New York	504-507
DYESTUFFS, MEDICINAL		Electrolabs Company, Pittsburgh	461	Knight, Maurice A., East Akron, O.	638-649
Keyl Laboratories, New York	1132	Electron Chemical Co., Portland, Me.	462-463	ELECTROLYTIC CELLS. See Cells, Electrolytic	
DYESTUFFS, "PONTACHEROME," "PONTACYE," "PONTAMINE"		Hercules Engineering Corp., New York	556-559	ELECTROLYTIC OXYGEN AND HYDROGEN APPARATUS	
Du Pont de Nemours, E. I., & Co., Wilmington	1116-1118	International Oxygen Co., Newark, N. J.	597	Electrolabs Company, Pittsburgh	461
DYEWOOD EXTRACTS. See Extracts, Dyewood		Warner Chemical Company, New York	935	International Oxygen Co., Newark, N. J.	597
DYEWOOD EXTRACT PLANTS. See Extractors					
DYEWOODS, GROUND AND CHIPPED					
American Dyewood Co., New York	1090				
Kilpstein, A. & Co., New York	1143				
DYNAMOS. See Generators					
DYNAMOS ELECTROPLATING. See Generators, Low-Voltage					
DYSPROSIUM OXALATE					
Welsbach Co., Gloucester, N. J.	1210				
"EAGLE" EJECTORS					
Sherwood Manufacturing Co., Buffalo	831				
"EAGLE-THISTLE BRAND" ALKALI					
Mathieson Alkali Works, Inc., New York	1152				
ECONOMIZERS, FUEL					
Ott, George F., Co., Philadelphia	744				
Sturtevant, B. F., Co., Hyde Park, Boston	869				
Carbonate Mach. Co., Carbonate, Pa.					
Green Fuel Economizer Co., Beacon, N. Y.					

The Symbol "♦" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12



## DYE STUFFS—Con.

Midland Blue B  
Milling Blue 2B  
Milling Yellow PO  
Mordant Green 2G  
Naphthol B. Black  
Naphthol Blue  
Naphthol Blue B  
Naphthol Blue E  
Naphthol Green  
Naphthol Yellow  
Naphthol Yellow S  
Naphthylamine Red  
Navy Blue G  
Navy Blue E  
Navy Blue for Wool  
Neutral Gray G  
New Brilliant Cotton Yellow L  
Conc.  
Nigrosine Blue Oil Sol.  
Nigrosine Blue Spirit Sol.  
Nigrosine Blue Water Sol.  
Nigrosine Jet Oil Sol.  
Nigrosine Jet Spirit Sol.  
Nigrosine Jet Water Sol.  
Oil Black  
Oil Black Walnut  
Oil Blue  
Oil Blue B  
Oil Brown  
Oil Cherry  
Oil Green  
Oil Mahogany Red  
Oil Orange  
Oil Orange Extra  
Oil Pink  
Oil Red  
Oil Scarlet  
Oil Violet  
Oil Walnut  
Oil Yellow  
Opal Blue  
Orange A  
Orange GG  
Orange GGE  
Orange I  
Orange II  
Orange Y  
Ortho-Cyanine B  
Ortho-Cyanine E  
Oxamine Violet Blue  
Pacoco Direct Brown C  
Pacoco Direct Brown M  
Pacoco Direct Fast Red F  
Pacoco Direct Green  
Pacoco Direct Gray  
Palachrome Blue G  
Palachrome Green G  
Palaside Black  
Palaside Blue G  
Palaside Blue E  
Palaside Brown B  
Palaside Green  
Patent Blue A  
Patent Blue V  
Permanent Red 4B  
Permanent Red E  
Pheno Black  
Pheno Blue  
Pheno Brown  
Pheno Green  
Pheno Orange  
Pheno Violet  
Pheno Yellow  
Phloxine  
Pigment Scarlet 3B  
Plum GG  
Ponceau 2G  
Ponceau 5E  
Ponceau Scarlet  
Potting Black CG  
Primazol Moss  
Primuline  
Primuline Extra Conc.  
Primuline SF (Developed)  
Primuline Superior (Developed)  
Pyrazol Orange G  
Quinoline Yellow  
Rajah Red  
Raspberry Red  
Resorcin Brown  
Rhodamine  
Rhodamine B Extra  
Rhodamine 6G Extra  
Roccelline  
Rodol A  
Rodol D  
Rodol DB  
Rodol DG  
Rodol 2G  
Rodol 4G  
Rodol 5A  
Rodol X  
Rodol Gray B  
Rodol Gray CD  
Rodol Gray E  
Rose Bengal  
Safranin  
Safranin Y  
Sap Brown  
Scarlet 2E  
Scarlet 2EG  
Scarlet 2EH

## DYE STUFFS—Con.

Scarlet 3E  
Serichrome Blue B  
Serichrome Green B  
Soluble Blue (Coal-tar Color)  
Soluble Blue for Ink  
Soluble Blue 2B  
Soluble Blue E  
Soluble Blue 2E  
Soluble Blue 2G  
Spirit Blue  
Steam Black  
Steam Blue  
Sudan I  
Sulfur Black  
Sulfur Black A  
Sulfur Blue  
Sulfur Blue 3B  
Sulfur Blue BCG Conc.  
Sulfur Blue BCG Conc.  
Sulfur Blue BCG Ex. Conc.  
Sulfur Blue 4BX Conc.  
Sulfur Blue BX  
Sulfur Blue BXXG  
Sulfur Brown  
Sulfur Brown C3E  
Sulfur Brown 2F  
Sulfur Brown X  
Sulfur Brown E  
Sulfur Cutch E  
Sulfur Drab, Hydro V  
Sulfur Fast Yellow G  
Sulfur Green  
Sulfur Green Conc.  
Sulfur Green BCG  
Sulfur Green DGB  
Sulfur Green G  
Sulfur Green G Conc.  
Sulfur Indigo Blue E  
Sulfur Indone 3E  
Sulfur Indone 2E  
Sulfur Khaki  
Sulfur Maroon E  
Sulfur Navy Blue  
Sulfur Olive  
Sulfur Olive O  
Sulfur Olive OD  
Sulfur Orange Brown  
Sulfur Sky Blue  
Sulfur Tan Conc.  
Sulfur Yellow  
Sulfur Yellow E  
Sulfur Red  
Table Black  
Tangier Orange  
Tartrazine  
Tartrazine BX  
Tartrazine XXX  
Tokio Orange  
Toluylene Brown  
Union Blue PE  
Union Blue PE  
Union Yellow PFF  
Uranine  
Victoria Blue B  
Victoria Green  
Victoria Red  
Victoria Scarlet 3E  
Victoria Violet  
Victoria Violet 4BS  
Violamine B  
Violamine E  
Violamine EB  
Wash Blue  
Wool Black  
Wool Black E  
Wool Black G Conc.  
Wool Blue GX  
Wool Claret  
Wool Fast Green BS  
Wool Fast Violet 4E Extra  
Wool Green E  
Wool Green S Conc.  
Wool Orange  
Wool Scarlet 2E  
Wool Violet ES  
Wright's Brilliant Sulfur Blue B  
Xylidene Scarlet

## DYE STUFFS

American Dyewood Co., New York  
Butterworth-Judson Corp., New York  
Chaplain & Bibbo, New York  
Dow Chemical Co., Midland, Mich.  
Du Pont de Nemours, E. I., & Co., Wilmington, Del.  
Gaskill Chemical Corp., Brooklyn  
Grasselli Chemical Co., Cleveland  
Heller & Herz Co., New York  
Kilpstein, A. & Co., New York  
Metz, H. A., & Co., Inc., New York  
National Aniline & Chemical Co., Inc., New York  
Newport Chemical Works, Inc., Passaic, N. J.  
Tower Manufacturing Co., Inc., New York  
Wolf, Jacques, & Company, Passaic, N. J.  
Zinsser & Co., Hastings, N. Y.  
Agawam Chem. Wks., Providence

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## DYE STUFFS—Con.

Althouse Chem. Co., Reading, Pa.  
Amalgamated Dyestuff & Chem. Wks., New York  
Amer. Aniline Prod., New York  
Amer. Synthetic Color Co., Stamford, Conn.  
Amer. Synthetic Dyes, Newark, N. J.  
Atlantic Dyestuff Co., Boston, Mass.  
Atlas Color Wks., Bklyn.  
Bachmeyer & Co., New York  
Beaver Chem. Co., Damascus, Va.  
Calif. Ink Co., W. Berkeley, Calif.  
Campbell, John & Co., New York, N. Y.  
Central Dyestuff & Chem. Co., Newark, N. J.  
Chem. Prod. Corp., Milwaukee  
Chrome Color Wks., Matawan, N. J.  
Cotton Chem. Co., Dundee Lake, N. J.  
Color Service Corp., New York  
Commonwealth Color & Chem. Co., Bklyn.  
Conn. Metal & Chem. Co., Berlin, Ct.  
Cooks, Falls, Dye Wks., Cooks Falls, N. Y.  
Cosmos Chem. Co., Plainfield, N. J.  
Dye Prod. & Chem. Co., New York  
Essex Aniline Wks., Boston  
Fergusson, Alex. C., Jr., Phila.  
Garfield Aniline Wks., Garfield, N. J.  
Genl. Supply Co., Perth Amboy, N. J.  
Heald, Jno. H., & Co., Inc., Lynchburg, Va.  
Heath Mfg. Co., St. Louis  
Holland Aniline Co., Holland, Mich.  
Holliday Kemp Co., New York  
Hub Dyestuff & Chem. Co., Boston  
Hydrocarbon Chem. Prod. Co., Lancaster, Pa.  
Indus. Chem. Co., Providence  
Kount South Prod. Co., Chicago  
King Chem. Co., New York  
Long & Co., W. H., New York  
May Chemical Works, Newark, N. J.  
Miller, Wm. T., Aniline & Chem. Co., Bklyn.  
Mineral Dye Prod., Trenton  
Monroe Color & Chem. Co., Quincy, Ill.  
N. Y. Color & Chem. Co., New York  
Noel Chem. & Color Wks., New York  
Oakwood Mfg. Co., Long Island City, N. Y.  
Obex Co., Marietta, Ohio  
Organic Prod. Corp., Schenectady  
Palatine Aniline & Chem. Corp., Boston  
Peerless Color Co., Bound Brook, N. J.  
Pharma Chem. Corp., New York  
Radiant Dye & Color Wks., Bklyn.  
Reliance Aniline & Chem. Co., New York  
Rowayton Aniline Wks., Rowayton, Conn.  
Schaper Chem. Co., Chicago  
Seydel Mfg. Co., Jersey City  
Sherwin-Williams Co., Cleveland  
Staler Chem. Co., New York  
Stamford Extract Mfg. Co., Stamford, Conn.  
Stanley Aniline Chem. Wks., Lock Haven, Pa.  
Sterling Color Co., New York  
Taylor-White Extracting Co., Camden, N. J.  
Trico Chem. Co., Buffalo  
Ultras Chem. Corp., New York  
United Chem. Prod. Corp., Jersey City  
United Indigo & Chem. Co., Boston  
U. S. Color & Chemical Co., Boston  
Univ. Aniline Dyes & Chem. Co., Milwaukee  
Wattmeyer & Pfister, New York  
White Tar Aniline Corp., New York  
Widder Bros., Bklyn.  
Williamshurg Chem. Co., Bklyn.  
Wright Chem. Corp., New York  
Young, J. S., & Co., Hanover, Pa.  
Zobel Co., Ernest, New York

## DYE STUFFS, ACRIDINE

Heyl Laboratories, New York.... 1132

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For List of Scientific and Technical Books, see page 1215

**ENAMELS, VITREOUS**

Porcelain Enamel & Mfg. Co., Baltimore	774
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**ENCLOSURES, WIRE**

Audubon Wire Cloth Co., Audubon, N. J.	806
Estey Wire Works Co., New York	470-471
Metal Fabrics Co., New York	700-701

**ENGINEERING CONTRACTORS**

Many of the firms in the following list specialize in some one line; others handle all kinds of engineering contracts. Time will be saved in all cases by consulting the pages on which these firms outline the nature of their services.

American Lead Burning Corp., New York	271
Badger, E. B. & Sons Co., Boston	310-329
Bleach Process Company, Appleton, Wis.	357
Buffalo Foundry & Machine Co., Buffalo	374-379
Cannon-Swenson Co., Chicago	384-385
Carrier Engineering Corp., Newark, N. J.	386
Chemical Equipment Co., Chicago	394-395
Cresson-Morris Company, Philadelphia	422-423
Cruse-Kemper Company, Ambler, Pa.	425
Distillation Industries, New York	491
Drying Systems, Inc., Chicago	448-449
Fleisher, W. L. & Co., Inc., New York	480-481
Garrigue, William, & Company, Chicago and New York	496-501
Glander & Company, Newark, N. J.	524-525
Guarantee Construction Co., New York	540-541
Hercules Engineering Corp., New York	556-559
Hope Engineering & Supply Co., Mt. Vernon, O.	572
International Oxygen Co., Newark, N. J.	597
Isbell-Porter Co., Newark, N. J.	600
Jeffrey Manufacturing Co., Columbus, O.	606-607
K-B Pulveriser Co., Inc., New York	617
Lasker Iron Works, Chicago	660
Lewis Recovery Co., Boston	664
Link-Belt Company, Chicago	667
Love Brothers, Inc., Aurora, Ill.	671
Malcolmson Engineering & Machinery Corp., Chicago	687
Mantius Engineering Co., Inc., New York	688-689
Meade, Richard K. & Co., Baltimore	696
Oakland Copper & Brass Works, Oakland, Cal.	732-733
Parks-Cramer Company, Fitchburg, Mass.	750
Ruggles-Coles Engineering Co., New York	818
Surface Combustion Co., New York	874-875
Thatcher, John, & Son, Brooklyn, N. Y.	885
U. S. & Cuban Allied Works Engineering Corp., New York	920
Wagner, J. H., Brooklyn, N. Y.	930

**ENGINEERS, BRIQUETTING**

Malcolmson Engineering & Machinery Corp., Chicago	687
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**ENGINEERS, CEMENT**

Hardinge Company, New York	544-545
Meade, Richard K. & Co., Baltimore	696
Smith, F. L. & Co., New York	

**ENGINEERS, CHEMICAL**

This does not purport to be a complete list of chemical engineers. It is a list of firms using space in the book which have chemical engineering services to offer.

Aome Coppersmithing Co., Chicago	249
Allbright-Nell Co., Chicago	260
Badger, E. B. & Sons Co., Boston	310-329
Bleach Process Company, Appleton, Wis.	357
Buffalo Foundry & Machine Co., Buffalo	374-379
Chemical Equipment Co., Chicago	394-395
Cruse-Kemper Company, Ambler, Pa.	425
Distillation Industries, New York	491
Duriron Company, Dayton, O.	450-453
Electro-Chemical Supply & Engineering Co., Philadelphia	460
Fairlie, Andrew M., Atlanta, Ga.	474
Garrigue, William, & Company, Chicago and New York	496-501
General Ceramics Company, New York	504-507
General Machine Company, Newark, N. J.	518-519
Glander & Company, Newark, N. J.	524-525
Hercules Engineering Corporation, New York	556-559
Lasker Iron Works, Chicago	660

**ENGINEERS, CHEMICAL—Con.**

Lewis, Green, McAdams & Knowland, Boston	664
Lewis Recovery Co., Boston	665
Little, Arthur D., Inc., Cambridge, Mass.	668
Mantius Engineering Co., Inc., New York	688-689
Meade, Richard K. & Co., Baltimore	696
Meigs, Bassett & Slaughter, Inc., Philadelphia	697
Oakland Copper & Brass Works, Oakland, Cal.	732-733
Perry & Webster, Inc., New York	760-761
U. S. & Cuban Allied Works Engineering Corp., New York	920
Zarembo Company, Buffalo	1081-1084

**ENGINEERS, CHEMICAL, CONSTRUCTION**

This does not purport to be a complete list of chemical engineers. It is a list of firms using space in the book which have chemical engineering services to offer.

Allbright-Nell Co., Chicago	260
American Lead Burning Corp., New York	271
Badger, E. B. & Sons Co., Boston	310-329
Bethlehem Foundry & Machine Co., South Bethlehem, Pa.	353
Bleach Process Company, Appleton, Wis.	357
Buffalo Foundry & Machine Co., Buffalo	374-379
Cannon-Swenson Co., Chicago	384-385
Chemical Equipment Co., Chicago	394-395
Cresson-Morris Company, Philadelphia	422-423
Cruse-Kemper Company, Ambler, Pa.	425
Distillation Industries, New York	491
Electrochemical Supply & Engineering Co., Philadelphia	460
Fairlie, Andrew M., Atlanta, Ga.	471
Garrigue, William, & Company, Chicago and New York	496-501
General Ceramics Company, New York	504-507
General Machine Company, Newark, N. J.	518-519
Glander & Company, Newark, N. J.	524-525
Guarantee Construction Co., New York	540-541
Hardinge Company, New York	544-545
Hercules Engineering Corp., New York	556-559
International Oxygen Co., Newark, N. J.	597
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Denver Fire Clay Co., Denver  
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Johnson, Matthey, & Co., New York

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Anthony Company, Long Island  
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## FORGINGS

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Clapp, E. D., Mfg. Co., Auburn,  
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Crucible Steel Co., Pittsburgh  
Crucible Steel Forge Co., Clevel-  
and  
Eccles, Richard, Co., Auburn,  
N. Y.  
Flory Mfg. Co., Bangor, Pa.  
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U. S. Aluminum Co., Pittsburgh

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town, Pa.  
Anderson Forge & Mach. Co.,  
Detroit  
Baerle & Morris, Phila.  
Krauter & Co., Newark, N. J.  
Pa. Forge Co., Phila.  
Rogers, C. E., Detroit  
Welscheder, Herm. Co., Mil-  
waukee

## FORGINGS, COPPER

Vendome Copper & Brass Works,  
Louisville, Ky.  
Amer. Brass Prod. Co., Potts-  
town, Pa.  
Baerle & Morris, Phila.  
Rogers, C. E., Detroit

## FORGINGS, DROP

American Car & Foundry Co., New  
York  
Vogt, Henry, Machine Co., Louis-  
ville, Ky.  
Anderson Forge & Mach. Co.,  
Detroit  
Belden Mach. Co., New Haven  
Bethlehem Steel Co., S. Bethle-  
hem, Pa.  
Billings & Spencer Co., Hartford  
Bonney Vise & Tool Works, Al-  
lentown, Pa.  
Buffalo Pitts Co., Buffalo  
Champion Mach. & Forge Co.,  
Cleveland  
Clapp, E. D., Mfg. Co., Auburn,  
N. Y.  
Columbus Forge & Iron Co., Co-  
lumbus, O.  
Drop Forging Co., Jersey City  
Endicott Forging & Mfg. Co.,  
Endicott, N. Y.

## FORGINGS, DROP—Con.

Genl. Drop Forge Co., Buffalo  
Indianapolis Drop Forging Co.,  
Indianapolis  
Keystone Drop Forge Wks.,  
Chester, Pa.  
Krauter & Co., Newark, N. J.  
Ladish-Oberberger Co., Cudahy,  
Wis.  
Lakeside Forge Co., Erie, Pa.  
McKay, James Co., Pittsburgh  
Moore Drop Forging Co., Spring-  
field, Mass.  
Page-Storins Drop Forge Co.,  
Chilopee, Mass.  
Pittsburgh Knife & Forge Co.,  
Pittsburgh  
Richmond Forgings Corp., Rich-  
mond, Va.  
Rockford Drop Forge Co., Rock-  
ford, Ill.  
Scranton Forging Co., Scranton,  
Pa.  
Steel Car Forge Co., Pittsburgh  
Strichy & Foote Co., Newark,  
N. J.  
Williams, J. H., & Co., Bklyn.

## FORGINGS, HOLLOW

Harrisburg Pipe & Pipe Bending  
Co., Harrisburg, Pa.

## FORGINGS, IRON AND STEEL

American Car & Foundry Co., New  
York  
Blehl Iron Works, Reading, Pa.  
Gifford-Wood Co., Hudson, N. Y.  
Love Brothers, Inc., Aurora, Ill.  
Reading Iron Co., Reading, Pa.  
Vogt, Henry, Machine Co., Louis-  
ville, Ky.  
Allison & Co., Chester, Pa.  
Amer. Bridge Co., New York  
Anderson Forge & Mach. Co.,  
Detroit  
Atlas Forgings Co., Chicago  
Billings & Spencer Co., Hartford  
Cauden Forge Co., Camden, N. J.  
Crucible Steel Forge Co., Clevel-  
and  
Genl. Drop Forge Co., Buffalo  
Haring, Ellsworth, New York  
Kropp Forge Co., Chicago  
Ladish-Oberberger Co., Cudahy,  
Wis.  
Midvale Steel Co., Phila.  
Natl. Forge & Tool Co., Erie, Pa.  
Oliver Iron & Steel Co., Pitts-  
burgh  
Otis Steel Co., Cleveland  
Penn. Fdry. & Mfg. Co., Reading,  
Pa.  
Pa. Forge Co., Phila.  
Pittsburgh Forge & Iron Co.,  
Pittsburgh  
Richmond Forgings Corp., Rich-  
mond, Va.  
Schuykill Forge Co., Phila.  
Standard Steel Wks. Co., Phila.  
Union Iron Works, Hoboken, N. J.  
Williams, J. H., & Co., Bklyn.

## FORGINGS, MONEL METAL

International Nickel Co., New  
York  
Amer. Brass Prod. Co., Potts-  
town, Pa.

## FORMALDEHYDE

Albany Chemical Company, Albany,  
N. Y.  
Campbell, C. W., Chemicals, New  
York  
Chaplain & Bibbo, New York  
Cooper, Chas., & Co., New York  
Orosthwaite, Ralph L., Co., New  
York  
Daigger, A., & Co., Chicago  
Fries & Fries, Co., Cincinnati  
Grasselli Chemical Co., Cleveland  
Herrick & Voigt, New York  
Hayden Chemical Co., Garfield, N. J.  
Klipstein, A., & Co., New York  
Powers - Weightman - Rosengarten  
Co., Philadelphia  
Riker, J. L. & D. S., Inc., New York  
Roessler & Hasslacher Chemical  
Co., New York  
Alexander, G. S., & Co., New York  
Cleveland-Cliffs Iron Co., Clevel-  
and  
Delta Chem. Co., Wells, Mich.  
Greeley Prod. Corp., New York  
Greeff, R. W., & Co., New York  
Hamden Paint & Chem. Co.,  
Boston  
Kali Mfg. Co., Phila.  
Melville Corbett Co., St. Marys,  
Pa.  
Merek & Co., New York  
Michigan Iron & Chem. Co.,  
Chicago  
Natl. Electrolytic Co., Niagara  
Falls  
Organic Salt & Acid Co., New  
York

## FORMALDEHYDE—Con.

Rockhill & Viator, New York  
Sargent, Chas. R., Co., Cleveland  
Standard Chem. Co., Toronto  
Stresen-Reuter & Biser, Chicago  
Wilson Chem. Co., New York  
FORMALDEHYDE, SOLIDIFIED  
Heyden Chemical Co., Garfield, N. J.  
FORMALDEHYDE 35-40% "BA-  
KER'S ANALYZED"  
Baker, J. T., Chemical Co., Phillips-  
burg, N. J.  
FORMALDEHYDE-ANILINE  
Roessler & Hasslacher Chemical  
Co., New York  
FORMANILIDE  
Roessler & Hasslacher Chemical  
Co., New York  
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"FORMOPON"  
Rohm & Haas Co., Phila

## FOSSIL FLOUR.

See Infusorial  
Earth

## FOUNDATION WORK

Guarantee Construction Co., New  
York  
Thatcher, John, & Son, Brooklyn,  
N. Y.  
Foundation Co., New York  
Fuller, Geo. A., Co., New York  
Ket, Norman Co., New York  
Stone & Webster, Boston  
Turner Const. Co., New York

FOUNDRY EQUIPMENT, ALU-  
MINUM

Hardinge Company, New York

## FOUNDRY FACINGS, GRAPHITE

Acheson Graphite Co., Niagara Falls  
Dixon, Jos., Crucible Co., Jersey  
City  
Stackpole Carbon Co., St. Marys,  
Pa.

FOUNDRY FACINGS, TALC AND  
SOAPSTONE

American Mineral Co., Johnson, Vt.  
Binney & Smith Co., New York  
Eastern Talc Co., Boston  
Georgia Talc Co., Asheville, N. C.  
Hammill & Gillespie, New York  
Harford Talc Co., Baltimore  
International Talc Co., New York  
Inyo Talc Co., Los Angeles  
Loomis, W. H., Talc Corp., Gou-  
vernneur, N. Y.  
Magness Talc Co., Waterbury, Vt.  
Standard Mineral Co., New York  
Talc Products Co., New York  
Talc & Soapstone Producers Assoc.,  
Washington, D. C.  
Uniform Fibrous Talc Co., New  
York  
Wagner, J. O., & Co., Easton, Pa.

FOUNTAINS, DRINKING, SANI-  
TARY

Clow, James B., & Sons, Chicago

## FRACTOL

Standard Oil Co. of N. J., New  
York

## FRAMES, SOAP

Allbright-Nell Co., Chicago  
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N. Y.  
Littleford Bros., Cincinnati

## FRAMES, MANHOLE

Clow, James B., & Sons, Chicago

## FRAMING, PIPE, FOR RACKS

Vulcan Rail & Construction Co.,  
Brooklyn, N. Y.

## FRAMING, PIPE, FOR SHELVING

Vulcan Rail & Construction Co.,  
Brooklyn, N. Y.

## FRAMING, PIPE, FOR TABLES

Vulcan Rail & Construction Co.,  
Brooklyn, N. Y.

## FRAMING, STEEL, FOR CONVEYORS

Vulcan Rail & Construction Co.,  
Brooklyn, N. Y.

## FRAMING, STEEL, FOR ELEVATORS

Vulcan Rail & Construction Co.,  
Brooklyn, N. Y.

FRAMING, STEEL, FOR ESCA-  
LATORS

Vulcan Rail & Construction Co.,  
Brooklyn, N. Y.

## FRAMING, STEEL, FOR GALLERIES

Vulcan Rail & Construction Co.,  
Brooklyn, N. Y.

## FRAMING, STEEL, FOR HOPPERS

Vulcan Rail & Construction Co.,  
Brooklyn, N. Y.

FRAMING, STEEL, FOR STRUC-  
TURAL PURPOSES

Vulcan Rail & Construction Co.,  
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Electric Heating Apparatus Co., Newark, N. J.	458-459	Hanovia Chemical & Mfg. Co., Newark, N. J.	546	Jeffrey Manufacturing Co., Columbus, O.	606-607
Hanovia Chemical & Mfg. Co., Newark, N. J.	546	Stupakoff Laboratories, Pittsburgh	868	Kilby Manufacturing Co., Cleveland	636
Stupakoff Laboratories, Pittsburgh	868	Will Corporation, Rochester	972-1066	Link-Belt Company, Chicago	667
Will Corporation, Rochester	972-1066	<b>FURNACES, OIL-BATH</b>		Newbold, R. S., & Sons, Co., Norristown, Pa.	722
Denver Fire Clay Co., Denver, Colo.		Mott, J. L., Iron Works, New York	713	Weller Manufacturing Co., Chicago	941
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				Bartlett, C. O., & Snow Co., Cleveland	338
				Garrigue, William, & Company, Chicago and New York	496-501
				Kutztown Fdry. & Machine Co., Philadelphia	652-653
				Scott, Ernest, & Co., Fall River, Mass.	828
				<b>GAS AND VAPOR-PROOF LIGHTING FIXTURES</b>	
				Benjamin Electric Mfg. Co., Chicago	847
				<b>GAS ABSORPTION APPARATUS, "HIERGENSELL"</b>	
				Hiergesell Bros., Philadelphia	560
				<b>GAS ANALYSIS.</b> See also Chemists, Analytical	
				Kope Engineering & Supply Co., Mt. Vernon, O.	572

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lyn, N. Y.	368	Detroit	433	Mass.	484
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Dalger, A., & Co., Chicago	428	New York	433	ter, Mass.	
Elmer & Amend, New York	457	Welded Steel Barrel Corps., Detroit	433	Smith Gas Engineering Co., Day-	836-837
Emerson Apparatus Co., Melrose,				ton, O.	
Mass.	467	GAS PLANTS, OIL		Tirrill Gas Machine Light Co., New	892
Glass Specialty Co., Newark, N. J.	523	General Oil Gas Co., Newark, N. J.	503	York	
Hiergesell Bros., Philadelphia	560	GAS PLANTS, OXYGEN AND HY-		Welded Steel Barrel Corps., Detroit	433
International Oxygen Co., Newark,		DROGEN		GAS TESTERS. See Testers, Gas	
N. J.	597	Electrolabs Company, Pittsburgh	461	GAS TESTING. See also Chemists,	
Marshall Nieha, Inc., Baltimore	692	International Oxygen Co., Newark,	597	Analytical	
Mine & Smelter Supply Co., New		N. J.		Hope Engineering & Supply Co.,	
York	704-705	GAS PLANTS, WATER		Mt. Vernon, O.	572
Palo Company, New York	719	Anthony Company, Long Island			
Precision Instrument Co., New-		City, N. Y.	292		
ark, N. J.	782-783	Bartlett Hayward Co., Baltimore	347	GAS TRAPS. See Traps, Gas	
Rovey Instrument & Chemicals Co.,		Isbell-Porter Co., Newark, N. J.	600	GAS VALVES. See Valves, Gas	
Buffalo	811	Lebanon Boiler Works, Lebanon,		GAS WASHING APPARATUS. See	
Standard Scientific Co., New York	862	Pa.	662	Washers, Gas	
Scientific Utilities Co., Inc., New		Petty, J. K., & Co., Philadelphia	662	GASKET MACHINES	
York	826-827	Wood, E. D., & Co., Philadelphia 1070-1071		Guyton & Gunter Mfg. Co., Chicago	539
Uehling Instrument Co., New York	904	GAS PLANTS, PRODUCER		GASKETS, ACID-PROOF	
Will Corporation, Rochester	972-1066	Blaw-Knox Company, Pittsburgh 358-361		Belmont Packing & Rubber Co.,	
GAS ANALYSIS APPARATUS, HY-		Duff Patents Co., Inc., Pittsburgh	447	Philadelphia	346
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Electrolabs Company, Pittsburgh	461	General Oil Gas Co., Newark N. J.	503	Brunswick, N. J.	527
International Oxygen Co., Newark,		Lebanon Boiler Works, Lebanon		Jenkin Bros., New York	608-611
N. J.	597	Pa.	662	Kearsey & Mattison Co., Ambler,	
GAS BENCHES. See Benches, Gas		Morgan Construction Co., Worces-	710	Pa.	619
Coal		ter, Mass.		New York Belting & Packing Co.,	
GAS, CARBONIC. See Carbon Di-		Petty, J. K., & Co., Philadelphia	662	New York	725
oxide		Smith Gas Engineering Co., Day-	836-837	Sarco Company, Inc., New York	819
GAS CLEANING PLANTS		ton, O.		United States Rubber Co., New	
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GAS CONDENSERS. See Condensers,		Akron and Semmes, New York		Belmont Packing & Rubber Co.,	
Gas		Ambler Gas Power Co., Pitts-		Philadelphia	346
GAS CONTROLLERS. See Regula-		burgh		Goetze Gasket & Packing Co., New	
tors, Gas		Chapman Eng. Co., Mt. Vernon, O.		Brunswick, N. J.	527
GAS GOVERNORS. See Governors,		Gas Eng. Co., Trenton, N. J.		Janos Asbestos Co., New York	604
Gas		Indus. Furnace Corp., Boston		Kearsey & Mattison Co., Ambler,	
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GAS MAINS. See Pipe, Cast-Iron		Cleveland		Brunswick, N. J.	527
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GAS-MAKING APPARATUS (FOR		GAS PRODUCERS, "BRADLEY"		Akron Metallic Gasket Co.,	
LABORATORIES, HOUSES)		WATER SEAL		Akron, O.	
Detrolt Heating & Lighting Co.,	433	Duff Patents Co., Inc., Pittsburgh	447	GASKETS, CORE	
Detroit	157	GAS PRODUCERS, "DUFF" WA-		Goetze Gasket & Packing Co., New	
Elmer & Amend, New York	157	TER SEAL		Brunswick, N. J.	527
Tirrill Gas Machine Lighting Co.,	892	Duff Patents Co., Inc., Pittsburgh	447	GASKETS, FELT	
New York	133	GAS PRODUCERS, "LIGNITE"		Goetze Gasket & Packing Co., New	
Welded Steel Barrel Corps., Detroit	133	Smith Gas Engineering Co., Day-	836-837	Brunswick, N. J.	527
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COMBINATION"		Morgan Construction Co., Worces-	710	port, Pa.	435
Detrolt Heating & Lighting Co.,	433	ter, Mass.		GASKETS, "GOETZE"	
Detroit	133	GAS PRODUCERS, "SHELDON"		Goetze Gasket & Packing Co., New	
Welded Steel Barrel Corps., Detroit	133	Blaw-Knox Company, Pittsburgh 358-361		Brunswick, N. J.	527
GAS-MAKING MACHINE, "TIRRILL		GAS PRODUCERS, TYPE "E. F."		GASKETS, LEAD	
EQUALIZING"		Smith Gas Engineering Co., Day-	836-837	Goetze Gasket & Packing Co., New	
Tirrill Gas Machine Lighting Co.,	892	ton, O.		Brunswick, N. J.	527
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GAS MIXERS. See Mixers, Gas		GAS PURIFICATION, "COTTRELL"		GASKETS, OIL-PROOF	
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Gas Machy. Co., Cleveland		Pennsylvania Salt Mfg. Co., Phila-	1169	Passaic, N. J.	690
Koppers Co., Pittsburgh		delphia		New York Belting & Packing Co.,	
U. G. I. Contracting Co., Phila.		Atlas Mineral Prod. Co., Merz-		New York	725
GAS PLANTS, COAL		town, Pa.		Sarco Company, Inc., New York	819
Bartlett Hayward Co., Baltimore	337	Connellly Iron Sponge & Governor		United States Rubber Co., New	
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Flinn & Drefein Co., Chicago	484	Cons. Gas Purification & Chem		Flexitallie Gasket Co., Camden,	
Isbell-Porter Co., Newark, N. J.	600	Co., New York		N. J.	
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cinnati		LABORATORY			
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Halse, George, Mfg. Co., New York	542-543		Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.	820				
Hunt, O. W., Co., Inc., West New Brighton, N. Y.	582-583		Uehling Instrument Co., New York	904				
Jeffrey Manufacturing Co., Colum- bus, O.	606-607		Tagliabue, C. J., Mfg. Co., Bklyn					
Link-Belt Company, Chicago	667		GAUGES, DRAFT "2 IN 1" AND "3 IN 1"					
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Jacoby, Henry E., New York	603
Kellogg, M. W. Co., New York	622-623
Kutznaw Foundry & Machine Co., Philadelphia	652-653
Mott, J. L., Iron Works, New York	713
Newbold, E. S., & Sons Co., Northtown, Pa.	722
New York Central Iron Works Co., Hagerstown, Md.	726
Reading Iron Co., Reading, Pa.	796-797
Rosedale Foundry & Machine Co., Pittsburgh	812
Sowers Mfg. Co., Buffalo	840-843
Sperry, D. E., & Co., Batavia, Ill.	844-846
U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.	916-917
KETTLES, "CHEMI-STEEL"	
Kellogg, M. W. Co., New York	622-623
KETTLES, COLOR. See Kettles, Dye	
KETTLES, COPPER	
Acme Coppersmithing Co., Chicago	249
Badger, E. B., & Sons Co., Boston	310-329
Baltimore Coppersmith Co., Baltimore	334
Berry, A., Copper Works, New York	348
Buffalo Steam Pump Co., Buffalo	373
Chesapeake Coppersmithing Co., Baltimore	397
Colton, Arthur, Company, Detroit	409
Consolidated Products Co., New York	411
Detroit Heating & Lighting Co., Detroit	433
Garrigue, William, & Company, Chicago and New York	496-501
Glander & Company, Newark, N. J.	524-525
Groen Mfg. Co., Chicago	538
Keller, George, Copper Works, Brooklyn	621

KETTLES, COPPER—Con.	
Kopperman, Jos., & Sons, Philadelphia	650
Koven, L. O., & Brother, Jersey City	651
Liberty Coppersmithing Co., Philadelphia	666
Lummus, Walter E., Co., Boston	674-681
Oakland Copper and Brass Works, Oakland, Cal.	732-733
Oat, Joseph, & Sons, Philadelphia	735
Ott, George F., Co., Philadelphia	744
Moos, Chas. A., Inc., New York	810
Textile-Finishing Machinery Co., Providence	884
Vendome Copper & Brass Works, Louisville	923
Walter, Theo. G., Jr., Newark, N. J.	933
Welded Steel Barrel Corp., Detroit	433
KETTLES, CRYSTALLIZING	
Acme Coppersmithing Co., Chicago	249
Badger, E. B., & Sons Co., Boston	310-329
Baltimore Coppersmith Co., Baltimore	334
Bethlehem Foundry & Machine Co., Bethlehem, Pa.	353
Berry, A., Copper Works, New York	348
Blaw-Knox Co., Pittsburgh	358-361
Brady, Jas. A., Foundry Co., Chicago	364
Buffalo Foundry & Machine Co., Buffalo	374-379
Chesapeake Coppersmithing Co., Baltimore	397
Chicago Bridge & Iron Works, Chicago	399
Consolidated Products Co., New York	411
Corbett, Geo. E., Boiler & Tank Co., Chicago	416
Dopp, H. W. Co., Buffalo	840-843
Glander & Company, Newark, N. J.	524-525
Jacoby, Henry E., New York	603
Keeler, E. Company, Williamsport, Pa.	620
Keller, George, Copper Works, Brooklyn	621
Kellogg, M. W. Co., New York	622-623
Kopperman, Jos., & Sons, Philadelphia	650
Kutznaw Foundry & Machine Co., Philadelphia	652-653
Lebanon Boiler Works, Lebanon, Pa.	662
Liberty Coppersmithing Co., Philadelphia	666
Lummus, Walter E., Co., Boston	674-681
Mott, J. L., Iron Works, New York	713
Oldman Boiler Works, Buffalo	740
Petty, J. K., & Co., Philadelphia	762
Pfaudler Co., Rochester	762
Reading Iron Co., Reading, Pa.	796-797
Rosedale Foundry & Machine Co., Pittsburgh	812
Sowers Mfg. Co., Buffalo	840-843
Sperry, D. E., & Co., Batavia, Ill.	844-846
Stuebner, G. L., Long Island City, N. Y.	867
Walter, Theo. G., Jr., Newark, N. J.	933
Warren City Tank & Boiler Co., Warren, O.	937
KETTLES, DESILVERING	
Fuller-Lehigh Company, Fullerton, Pa.	492-493
KETTLES, "DOFF"	
Sowers Mfg. Co., Buffalo	840-843
KETTLES, DYE	
Acme Coppersmithing Co., Chicago	249
Baltimore Coppersmith Co., Baltimore	334
Chesapeake Coppersmithing Co., Baltimore	397
Consolidated Products Co., New York	411
Dopp, H. W. Co., Buffalo	840-843
Elyria Enamelled Products Co., Elyria, O.	466
Glander & Company, Newark, N. J.	524-525
Groen Mfg. Co., Chicago	538
Jacoby, Henry E., New York	603
Kellogg, M. W. Co., New York	622-623
Kopperman, Jos., & Sons, Philadelphia	650
Lummus, Walter E., Co., Boston	674-681
Mott, J. L., Iron Works, New York	713
Oakland Copper & Brass Works, Oakland, Cal.	732-733
Oat, Joseph, & Sons, Philadelphia	735
Ott, George F., Co., Philadelphia	744
Pfaudler Co., Rochester	762
Moos, Chas. A., Inc., New York	810
Sowers Mfg. Co., Buffalo	840-843
Sperry, D. E., & Co., Batavia, Ill.	844-846
Stuart & Peterson Co., Burlington, N. J.	916-917
Textile-Finishing Machinery Co., Providence	884
Walter, Theo. G., Jr., Newark, N. J.	933
KETTLES, ENAMELED	
Consolidated Products Co., New York	411
Elyria Enamelled Products Co., Elyria, O.	466

Mentioning this catalog when writing firms enables us to give you a better reference work next year.

For List of Scientific and Technical Books, see page 1215

KETTLES, ENAMELED—Con.		KETTLES, STEAM-JACKETED—		KETTLES, TAR AND FITCH—Con.	
Mott, J. L. Iron Works, New York	713	Con.		Kutztown Foundry & Machine Co., Philadelphia	652-653
Pfandler Company, Rochester	762	Downingtown Iron Works, Inc., Downingtown, Pa.	445	Lebanon Boiler Works, Lebanon, Pa.	662
Sperry, D. E. & Co., Batavia, Ill.	844-846	Duriron Company, Dayton, O.	450-453	Lummas, Walter E. Co., Boston	674-681
Stuart & Peterson Co., Burlington, N. J.	866	Elyria Enameled Products Co., Elyria, Pa.	466	Newbold, E. S. & Sons Co., Norristown, Pa.	722
<b>KETTLES, GLASS-ENAMELED</b>		Eureka Machine Co., Cleveland	469	New York Central Iron Works Co., Hagerstown, Md.	726
Elyria Enameled Products Co., Elyria, Pa.	466	Garrigue, William & Company, Chicago and New York	196-501	Petty, J. K. & Co., Philadelphia	662
Pfandler Company, Rochester	762	Glander & Company, Newark, N. J.	521-525	Sowers Mfg. Co., Buffalo	840-843
<b>KETTLES, GREASE, STEEL</b>		Groen Mfg. Co., Chicago	538	Sperry, D. E. & Co., Batavia, Ill.	844-846
Blaw-Knox Company, Pittsburgh	358-361	Heracles Engineering Corp., New York	556-559	Struthers-Wells Co., Warren, Pa.	864-865
Warren City Tank & Boiler Co., Warren, O.	937	Hodge Boiler Works, East Boston, Mass.	564	Stuebner, G. L., Long Island City, N. Y.	867
<b>KETTLES, HEATING, ASPHALT</b>		Houchin-Aiken Co., Brooklyn	578-579	Warren City Tank & Boiler Co., Warren, O.	937
Stuebner, G. L., Long Island City	867	International Engineering Works, Inc., Framingham, Mass.	591-593	<b>KETTLES, TIN OR SILVER-LINED</b>	
<b>KETTLES, JACKETED. See Kettles, Steam-Jacketed</b>		Jacoby, Henry E., New York	604	Acme Coppersmithing Co., Chicago	249
<b>KETTLES, LEAD-LINED</b>		Keller, E. Company, Williamsport, Pa.	620	Badger, E. B. & Sons Co., Boston	310-329
Abernethy, John F., Brooklyn, N. Y.	246	Keller, George, Copper Works, Brooklyn	621	Groen Mfg. Co., Chicago	538
Acme Coppersmithing Co., Chicago	249	Kellogg, M. W. Co., New York	622-623	Lummas, Walter E. Co., Boston	674-681
American Lead Burning Corp., New York	271	Kopperman, Jos. & Sons, Philadelphia	650	Kellogg, M. W. Co., New York	622-623
Badger, E. B. & Sons Co., Boston	310-329	Koven, L. O. & Brother, Jersey City	651	Kopperman, Jos. & Sons, Philadelphia	650
Bethlehem Foundry & Machine Co., Bethlehem, Pa.	353	Kutztown Foundry & Machine Co., Philadelphia	652-653	Oakland Copper & Brass Works, Oakland, Cal.	732-733
Bethlehem Foundry & Machine Corp., New York	350-352	Lancaster Iron Works, Lancaster, Pa.	656-657	Ott, Geo. F. Co., Philadelphia	744
Groen Mfg. Co., Chicago	538	Lebanon Boiler Works, Lebanon, Pa.	662	Roos, Chas. A. Inc., New York	810
Jacoby, Henry E., New York	604	Liberty Coppersmithing Co., Philadelphia	666	United Lead Company, New York	911-915
Kopperman, Jos. & Sons, Philadelphia	650	Lummas, Walter E. Co., Boston	674-681	<b>KETTLES, VACUUM</b>	
Lummas, Walter E. Co., Boston	674-681	Mott, J. L. Iron Works, New York	713	Acme Coppersmithing Co., Chicago	249
Oakland Copper & Brass Works, Oakland, Cal.	732-733	Newbold, E. S. & Sons Co., Norristown, Pa.	722	Badger, E. B. & Sons Co., Boston	310-329
Sperry, D. E. & Co., Batavia, Ill.	844-846	New York Central Iron Works Co., Hagerstown, Md.	726	Baltimore Coppersmith Co., Baltimore	334
United Lead Company, New York	911-915	Nordberg Mfg. Co., Milwaukee	728-729	Berry, A. Copper Works, New York	348
<b>KETTLES, MIXING</b>		Oakland Copper & Brass Works, Oakland, Cal.	732-733	Bethlehem Foundry & Machine Corp., New York	350-352
Any of the manufacturers of kettles will supply them equipped with agitators or stirrers, thereby making them mixing kettles, hence look under the material which the kettle is to be made		Oat, Joseph, & Sons, Philadelphia	735	Blaw-Knox Company, Pittsburgh	358-361
<b>KETTLES, NITRATING. See Nitratators</b>		Oldman Boiler Works, Buffalo	740	Brady, James A., Foundry Co., Chicago	364
<b>KETTLES, OIL-JACKETED</b>		Ott, George F. Co., Philadelphia	744	Buffalo Foundry & Machine Co., Buffalo	374-379
Bethlehem Foundry & Machine Corp., New York	350-352	Petty, J. K. & Co., Philadelphia	662	Chesapeake Coppersmithing Co., Baltimore	397
Dopp, H. W., Buffalo	840-843	Pfandler Co., Rochester, N. Y.	762	Consolidated Products Co., New York	411
Glander & Company, Newark, N. J.	521-525	Roos, Chas. A. Inc., New York	810	Corbett, Geo. E., Boiler & Tank Co., Chicago	416
Sowers Mfg. Co., Buffalo	840-843	Rosedale Foundry & Machine Co., Pittsburgh	812	Cruse-Kemper Co., Ambler, Pa.	425
<b>KETTLES, PAINT</b>		Somers Mfg. Co., Buffalo	810-813	Davine, J. P. Co., Buffalo	436-437
New York Central Iron Works Co., Hagerstown, Md.	726	Sperry, D. E. & Co., Batavia, Ill.	844-846	Dopp, H. W. Co., Buffalo	840-843
<b>KETTLES, PLATED STEEL</b>		Stokes, F. J., Machine Co., Philadelphia	858-860	Elyria Enameled Products Co., Elyria, Pa.	466
Kellogg, M. W. Co., New York	622-623	Struthers-Wells Co., Warren, Pa.	864-865	Garrigue, William & Company, Chicago and New York	196-501
<b>KETTLES, REDUCTION. See Reducers</b>		Stuart & Peterson Co., Burlington, N. J.	866	General Ceramics Company, New York	501-507
<b>KETTLES, SMELTING</b>		Stuebner, G. L., Long Island City, N. Y.	867	Glander & Company, Newark, N. J.	521-525
Rosedale Foundry & Machine Co., Pittsburgh	812	Tippett & Wood, Phillipsburg, N. J.	891	Groen Mfg. Co., Chicago	538
<b>KETTLES, SOAP</b>		United Lead Company, New York	911-915	Jacoby, Henry E., New York	604
Dopp, H. W. Co., Buffalo	840-843	Vandome Copper & Brass Works, Louisville	924	Hodge Boiler Works, East Boston, Mass.	564
Garrigue, William & Company, Chicago and New York	196-501	Walter, Theo. C. Jr., Newark, N. J.	943	Keller, George, Copper Works, Brooklyn	621
New York Central Iron Works Co., Hagerstown, Md.	726	Warren City Tank & Boiler Co., Warren	947	Kellogg, M. W. Co., New York	622-623
Sowers Mfg. Co., Buffalo	840-843	Welded Steel Barrel Corp., Detroit	133	Kopperman, Jos. & Sons, Philadelphia	650
Struthers-Wells Co., Warren, Pa.	864-865	<b>KETTLES, STEAM-JACKETED, FORGE-WELDED</b>		Kutztown Foundry & Machine Co., Philadelphia	652-653
<b>KETTLES, SILVER PLATED</b>		American Welding Co., Carbondale, Pa.	285	Lancaster Iron Works, Lancaster, Pa.	656-657
Kellogg, M. W. Co., New York	622-623	Blaw-Knox Co., Pittsburgh	358-361	Lebanon Boiler Works, Lebanon, Pa.	662
<b>KETTLES, STEAM-JACKETED</b>		Kellogg, M. W. Co., New York	622-623	Liberty Coppersmithing Co., Philadelphia	666
Acme Coppersmithing Co., Chicago	249	<b>KETTLES, STEEL, COPPER-PLATED</b>		Lummas, Walter E. Co., Boston	674-681
Allbright-Wall Co., Chicago	260	Kellogg, M. W. Co., New York	622-623	Newbold, E. S. & Sons Co., Norristown, Pa.	722
American Welding Co., Carbondale, Pa.	285	<b>KETTLES, STEEL, FORGE-WELDED</b>		New York Central Iron Works Co., Hagerstown, Md.	726
Badger, E. B. & Sons Co., Boston	310-329	American Welding Co., Carbondale, Pa.	285	Nordberg Mfg. Co., Milwaukee	728-729
Baltimore Coppersmith Co., Baltimore	334	Blaw-Knox Co., Pittsburgh	358-361	Oakland Copper & Brass Works, Oakland, Cal.	732-733
Berry, A. Copper Works, New York	348	Kellogg, M. W. Co., New York	622-623	Oat, Joseph, & Sons, Philadelphia	735
Bethlehem Foundry & Machine Co., Bethlehem, Pa.	353	<b>KETTLES, STONEWARE, ALL TYPES</b>		Oldman Boiler Works, Buffalo	740
Bethlehem Foundry & Machine Corp., New York	350-352	Acid Proof Clay Products Co., Akron, O.	248	Ott, George F. Co., Philadelphia	744
Biggs Boiler Works, Akron, O.	355	General Ceramics Company, New York	504-507	Petty, J. K. & Co., Philadelphia	662
Blaw-Knox Company, Pittsburgh	358-361	Knight, Maurice A., East Akron, O.	648-649	Pfandler Co., Rochester	762
Brady, Jas. A., Foundry Co., Chicago	364	<b>KETTLES, SULFONATING. See Sulfonators</b>		Roos, Chas. A. Inc., New York	810
Buffalo Foundry & Machine Co., Buffalo	374-379	<b>KETTLES, TAR AND FITCH</b>		Rosedale Foundry & Machine Co., Pittsburgh	812
Chesapeake Coppersmithing Co., Baltimore	397	Beckley Perforating Co., Garwood, N. J.	345	Scott, Ernest & Co., Fall River, Mass.	828
Chicago Bridge & Iron Works, Chicago	399	Biehl Iron Works, Reading, Pa.	354	Somers Mfg. Co., Buffalo	840-843
Colton, Arthur, Company, Detroit	409	Blaw-Knox Co., Pittsburgh	358-361	Sperry, D. E. & Co., Batavia, Ill.	844-846
Consolidated Products Co., New York	411	Chicago Bridge & Iron Works, Chicago	399	Stokes, F. J., Machine Co., Philadelphia	858-860
Corbett, Geo. E., Boiler & Tank Co., Chicago	416	Consolidated Products Co., New York	411	Stuart & Peterson Co., Burlington, N. J.	866
Cruse-Kemper Company, Ambler, Pa.	425	Downingtown Iron Works, Inc., Downingtown, Pa.	445	Stuebner, G. L., Long Island City, N. Y.	867
Day, J. H. Company, Cincinnati	431	Dopp, H. W. Co., Buffalo	840-843	United Lead Company, New York	911-915
Detroit Heating & Lighting Co., Detroit	433	Eureka Machine Co., Cleveland	469	U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.	916-917
Davine, J. P. Co., Buffalo	436-437	Groen Mfg. Co., Chicago	538	Walter, Theo. C. Jr., Newark, N. J.	933
Dopp, H. W. Co., Buffalo	840-843	Jacoby, Henry E., New York	603	Warren City Tank & Boiler Co., Warren, O.	937
		Kellogg, M. W. Co., New York	622-623	<b>KETTLES, VARNISH</b>	
		Koven, L. O. & Brother, Jersey City, N. J.	651	Acme Coppersmithing Co., Chicago	249
				Berry, A. Copper Works, New York	348
				Blaw-Knox Co., Pittsburgh	358-361

The Symbol "®" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

KETTLES, VARNISH—Con.		KILNS, LIME—Con.		LABELING MACHINES—Con.	
Chicago Bridge & Iron Works, Chicago	399	Newbold, R. S., & Sons Co., Norristown, Pa.	722	Pneumatic Scale Corp., Norfolk, Iowa, Mass.	770-771
Consolidated Products Co., New York	411	Ruggles-Coles Engineering Co., New York	818	Part Machine Co., Balto.	
Cruse-Kemper Co., Ambler, Pa.	425	Stacey-Schmidt Mfg. Co., York, Pa.	854	Economic Mach. Co., Worcester, Mass.	
Detroit Heating & Lighting Co., Detroit	433	Swanson Evaporator Co., Chicago	876-881	Magnus, A. Sons Co., Chicago	
Dopp, H. W., Co., Buffalo	840-843	La Cour Iron Works, Inc., Long Island City, N. Y.		Natl. Labeling Mach. Co., Long Island City, N. Y.	
Glander & Company, Newark, N. J.	524-525	Smidth, F. L., & Co., New York			
Gross Mfg. Co., Chicago	538	Vulcan Iron Wks., Wilkes-Barre, Pa.			
Jacoby, Henry E., New York	603				
Kellogg, M. W., Co., New York	622-623	<b>KILNS, LIME, "ELDERED"</b>			
Koppelman, Jos., & Sons, Philadelphia	650	Stacey-Schmidt Mfg. Co., York, Pa.	854	<b>LABORATORIES, RESEARCH</b>	
Long Island Foundry Co., Long Island City, N. Y.	669	<b>KILNS, LIME, "KEYSTONE"</b>		Buffalo Foundry & Machine Co., Buffalo	374-379
Lummus, Walter E., Co., Boston	674-681	Stacey-Schmidt Mfg. Co., York, Pa.	854	Dorr Company, New York	440-441
Mott, J. L., Iron Works, New York	713	<b>KILNS, OIL BURNING</b>		Lewis, Green, McAdams & Knowland, Boston	664
Newbold, R. S., & Sons Co., Norristown, Pa.	722	Stacey-Schmidt Mfg. Co., York, Pa.	854	Little, Arthur D., Inc., Cambridge, Mass.	668
Oakland Copper & Brass Works, Oakland, Cal.	742-733	<b>KILNS, ROTARY</b>		Meade, Richard K., & Co., Baltimore	696
Oat, Joseph, & Sons, Philadelphia	711	American Process Company, New York	276	Meigs, Bassett & Slaughter, Philadelphia	697
Ott, George F., Co., Philadelphia	714	Bartlett, O. O., & Snow Co., Cleveland	338	<b>LABORATORIES, TESTING</b>	
Roos, Chas. A., Inc., New York	810	Christie, F. R., Company, Pittsburgh	401	Lewis, Green, McAdams & Knowland, Boston	664
Sowers Manufacturing Co., Buffalo	810-813	Crescent Refractories Co., Cuyahoga Falls, Pa.	419	Little, Arthur D., Inc., Cambridge, Mass.	668
Sperry, D. E., & Co., Batavia, Ill.	841-846	Cruse-Kemper Co., Ambler, Pa.	425	Meade, Richard K., & Co., Baltimore	696
Struthers-Wells Co., Warren, Pa.	864-865	Meade, Richard K., & Co., Baltimore	696	Meigs, Bassett & Slaughter, Philadelphia	697
Walter, Theo. C., Jr., Newark, N. J.	913	Ruggles-Coles Engineering Co., New York	818	Stupakoff Laboratories, Pittsburgh	868
Welded Steel Barrel Corp., Detroit	433	Struthers-Wells Co., Warren, Pa.	864-865	<b>LABORATORY APPARATUS AND SUPPLIES</b>	
<b>KETTLES, WATER-JACKETED.</b>		Swenson Evaporator Co., Chicago	876-881	Brooklyn Thermometer Co., Brooklyn, N. Y.	868
See Kettles, Steam-jacketed.		Albis-Chalmers Mfg. Co., Milwaukee		Clafin, Geo. L., Co., Providence, R. I.	405
<b>KETTLES, WROUGHT IRON</b>		Barnett, C., Canton, O.		Daigger, A., & Co., Chicago	428
Buffalo Steam Pump Co., Buffalo	373	Kennedy-Van Sant Mfg. & Eng. Corp., New York		Eimer & Amend, New York	457
Glander & Company, Newark, N. J.	524-525	La Cour Iron Wks., Long Island City, N. Y.		Emerson Apparatus Co., Melrose, Mass.	467
Reading Iron Co., Reading, Pa.	796-797	Smidth, F. L., & Co., New York		Glass Specialty Co., Newark, N. J.	523
Struthers-Wells Co., Warren, Pa.	864-865	Vulcan Iron Wks., Wilkes-Barre, Pa.		Griebel Instrument Co., Inc., Carbondale, Pa.	537
<b>KETTLES, WROUGHT STEEL</b>				International Oxygen Co., Newark, N. J.	597
Mitchell, W. K., Co., Philadelphia	703	<b>KJELDAHL APPARATUS</b>		Marshall Richa, Inc., Baltimore	692
<b>"KEWAUNEE" LABORATORY FURNITURE</b>		Brooklyn Thermometer Co., Brooklyn, N. Y.	368	Mine & Smelter Supply Co., New York	704-705
Kewanee Mfg. Co., Kewanee, Wis.	631	Clafin, Geo. L., Co., Providence, R. I.	405	Palo Company, New York	749
Denver Fire Clay Co., Denver		Daigger, A., & Co., Chicago	428	Movay Instrument & Chemical Co., Buffalo	814
<b>"KEYSTONE" LIME KILNS</b>		Eimer & Amend, New York	457	Scientific Utilities Co., Inc., New York	826-827
Stacey-Schmidt Mfg. Co., York, Pa.	854	Glass Specialty Co., Newark, N. J.	524	Standard Scientific Co., New York	852
<b>KILNS.</b> See also Dyeing Machinery.		Griebel Instrument Co., Carbondale, Pa.	537	Will Corporation, Rochester	972-1066
International Engineering Works, Inc., Framingham, Mass.	594-595	Hiergesell Brothers, Philadelphia	560	<b>LABORATORY APPARATUS AND SUPPLIES, VITREOUS</b>	
Lebanon Boiler Works, Lebanon, Pa.	662	Kimble Glass Co., Vineland, N. J.	617	Thermal Syndicate, Ltd., New York	886-889
Petty, J. K., & Co., Philadelphia	662	Marshall Richa, Inc., Baltimore	692	<b>LABORATORY BACKS, ALBERENE STONE</b>	
Textile-Finishing Machinery Co., Providence	884	Mine & Smelter Supply Co., New York	704-705	Alberene Stone Company, New York	258-259
<b>KIESELGUR.</b> See Infusorial Earth.		Palo Company, New York	749	<b>LABORATORY CHEMICALS.</b> See Chemicals, Fine.	
<b>KILNS, BAKING</b>		Movay Instrument & Chemical Co., Buffalo	814	<b>LABORATORY EQUIPMENT, COPPER.</b> See Experimental Equipment.	
Koven, L. O., & Brother, Jersey City	651	Scientific Utilities Co., Inc., New York	826-827	<b>LABORATORY FILTERS.</b> See Filters.	
Crandall Pettie Co., New York		Standard Scientific Co., New York	852	<b>LABORATORY FIXTURES.</b> See Fixtures, Laboratory, also under specific heads.	
<b>KILNS, BONE BLACK</b>		Will Corporation, Rochester	972-1066	<b>LABORATORY FLOORING.</b> See Flooring, Laboratory.	
Love Brothers, Inc., Aurora, Ill.	671	<b>KJELDAHL FLASKS.</b> See Flasks.		<b>LABORATORY FURNITURE.</b> See under specific heads.	
Colwell, Lewis, Chicago		<b>KNEADING MACHINES</b>		<b>LABORATORY GUTTERS</b>	
<b>KILNS, CEMENT</b>		Abbé, Paul O., New York	241-245	Alberene Stone Company, New York	258-259
Coatesville Boiler Works, Coatesville, Pa.	408	Baker Sons & Perkins Co., Jos., White Plains, N. Y.	333	<b>LABORATORY HOOD BASES</b>	
Cruse-Kemper Co., Ambler, Pa.	425	Day, J. H., Co., Cincinnati	431	Alberene Stone Company, New York	258-259
Kutztown Foundry & Machine Co., Philadelphia	652-653	Werner & Pfleiderer Co., White Plains, N. Y.	942-943	<b>LABORATORY HOOD EXHAUSTERS.</b> See Fans, Ventilating.	
Ruggles-Coles Engineering Co., New York	818	<b>KNOX'S APPARATUS.</b> See Laboratory Apparatus and Supplies.		<b>LABORATORY HOOD SUPER-STRUCTURES</b>	
Struthers-Wells Co., Warren, Pa.	864-865	<b>"KNOX" WATER COOLERS, HIGH TEMPERATURE FURNACES</b>		Alberene Stone Company, New York	258-259
La Cour Iron Works, Inc., Long Island City, N. Y.		Blaw-Knox Company, Pittsburgh	358-361	<b>LABORATORY HOOD TABLES AND SUPPORTS</b>	
Smidth, F. L., & Co., New York		<b>KOBER'S NEPHELOMETER.</b> See Laboratory Apparatus and Supplies.		Acid Proof Clay Products Co., Akron, O.	248
<b>KILNS, CHAR</b>		<b>KORLAUSCH SUGAR FLASKS.</b> See Laboratory Apparatus and Supplies.		Alberene Stone Company, New York	258-259
Chicago Bridge & Iron Works, Chicago	339	<b>"KOLOYDO"</b>		General Ceramics Co., New York	504-507
Distillation Industries, New York	491	Waldo, E. M., & F., New York	1208	Kewanee Mfg. Co., Kewanee, Wis.	631
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General Platers Supply Co., New York		<b>NICKEL OXIDE, C. P. "BAKER'S ANALYZED"</b>		Seydel Mfg. Co., Jersey City	
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Organic Prod. Corp., Schenectady  
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**NAPHTHOL, METHYL ESTER, BETA-**  
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**NAPHTHOL GREEN**  
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Chem. Prod. Corp., Milwaukee  
Dye Prod. & Chem. Co., New York  
**NAPHTHOL YELLOW**  
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Hord Color Products Co., Sandusky, O.  
**NAPHTHOL YELLOW S**  
Hord Color Products Co., Sandusky, O.  
**NAPHTHOL YELLOW, CERTIFIED, FOR FOOD**  
Kenart Synth. Prod. Co., Chicago  
**NAPHTHOL BENZOATE, BETA-**  
Amer. Drug Co., Montreal  
Chem. Co. of Amer., New York  
Morgenstern & Co., New York  
Organic Prod. Corp., Schenectady  
Segal, Geo. H., Co., New York  
Seydel Mfg. Co., Jersey City  
Syntheur Scientific Labs., Monticello, N. Y.  
**NAPHTHOL SALICYLATE, BETA-**  
Morgenstern & Co., New York  
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**NAPHTHYLAMINE, ALPHA-**  
Barrett Company, New York 1096-1097  
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**NAPHTHYLAMINE, BETA-**  
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**NAPHTHYLAMINESULFONIC ACID.**  
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**"NATROGEN" BOILING OUT ALKALI FOR TEXTILES**  
Fornier, L. B. Co., Phila.  
**"NATROPOL" SULFONATED OIL**  
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**"NATRONA" PRODUCTS**  
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**NAVY BLUE**  
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**NECKS, "INTERLOCK" WELDED**  
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh 766-768  
**"NELSON" ELECTROLYTIC CELLS**  
Warner Chemical Co., New York 935  
**NEODYMIUM-AMMONIUM NITRATE**  
Welsbach Co., Gloucester, N. J. 1210  
**NEODYMIUM CHLORIDE**  
Welsbach Co., Gloucester, N. J. 1210  
**NEODYMIUM-MAGNESIUM NITRATE**  
Welsbach Co., Gloucester, N. J. 1210  
**NEODYMIUM OXALATE**  
Welsbach Co., Gloucester, N. J. 1210  
**NEODYMIUM OXIDE**  
Welsbach Co., Gloucester, N. J. 1210  
**NEODYMIUM OXIDE, HYDRATED**  
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**NEODYMIUM SULFATE**  
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**NERNST LAMPS.** See Lamps, Nernst  
**NEROLIN**  
Chiris, Antoine, Co., New York 1108  
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Orbis Prod. Trading Co., New York  
Organic Prod. Corp., Schenectady  
Syntheur Scientific Labs., Monticello, N. Y.  
**NEERYL ACETATE**  
Vap. Dye & Co., New York  
**NESSLER CYLINDERS.** See Cylinders, Nessler  
**NETS, DYE**  
Hooper, W. E., & Sons Co., Philadelphia 570  
**NETTING, WIRE**  
Estey Wire Works Co., New York 470-471  
Ludlow-Saylor Wire Co., St. Louis 672  
Metal Fabrics Co., New York 700-701  
**NEUTRAL GRAY G**  
Newport Chemical Works, Inc., Passaic, N. J. 1164-1165  
Calco Chem. Co., Bound Brook, N. J.  
**NEUTRALIZERS.** See Tanks  
**NEVILLE AND WINTER'S ACID.**  
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**"NIAGARA" ALKALI PRODUCTS**  
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**"NICHROME"**  
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Ark. Zinc & Smelt Corp., New York  
Balbach Smelt & Ref. Co., Newark, N. J.  
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Cons. Min. & Smelt. Co., Trall, B. C.  
Crown Rheostat & Supply Co., Chicago  
Deloro Min. & Reduc. Co., Toronto  
Driver-Harris Wire Co., Harrison, N. J.

The Symbol "S" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

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Ill. Smelt. & Ref. Co., Chicago		Will Corporation, Rochester	972-1066	Dicks, David, Co., New York	
Irvington Smelt. & Ref. Wks., Irvington, N. J.		Merck & Co., New York		Indus. Chem. Co., Providence	
Metals Chem. Ltd., Welland, Ont., Mo.		Sloan & Russell, New York		Seydel Mfg. Co., Jersey City	
Mo. Cobalt Co., Fredricktown, Mo.		Squibb, E. R. & Sons, New York			
Nassau Smelt. & Ref. Wks., New York		<b>NICKEL NITRATE, C. P. "BAKER'S ANALYZED"</b>		<b>NIGROSINE JET, OIL SOLUBLE</b>	
Pa. Smelt. Co., Pittsburgh		Baker, J. T., Chemical Co., Phil- lipsburg, N. J.	1095	Heller & Metz Co., New York	1128
Phelps, Dodge & Co., New York		<b>NICKEL OXIDES</b>		Klipstein, A. & Co., New York	1143
Richards & Co., Boston		Chaplain & Bibbo, New York	1106	National Aniline & Chemical Co., Inc., New York	1159
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U. S. Smelt. Ref. & Min. Co., Boston		Drakenfeld, B. F., & Co., Inc., New York	1115	Foster-Heaton Co., Newark, N. J.	
Va. Smelt. Co., Boston		Harshaw Fuller & Goodwin Co., Cleveland	1127	Seydel Mfg. Co., Jersey City	
<b>NICKEL-AMMONIUM SULFATE</b>		International Nickel Co., New York	1138-1139	<b>NIGROSINE JET, SPIRIT SOLUBLE</b>	
Chaplain & Bibbo, New York	1106	Rossler & Hasselacher Chemical Co., New York	1178-1179	Heller & Metz Co., New York	1128
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Drakenfeld, B. F., & Co., Inc., New York	1115	Deloro Smelt. & Ref. Co., Deloro, Ont.		Metz, H. A. & Co., Inc., New York	1154
Harshaw Fuller & Goodwin Co., Cleveland	1127	Genl. Metallic Oxides Co., Jersey City		National Aniline & Chemical Co., Inc., New York	1159
International Nickel Co., New York	1138-1139	Hochmeister - Lind Chem. Co., Pittsburgh		Central Dyestuff & Chem. Co., Newark, N. J.	
Rossler & Hasselacher Chemical Co., New York	1178-1179	Import Chem. Co., Jersey City		Dicks, David, Co., New York	
Will Corporation, Rochester	972-1066	Mo. Cobalt Co., Fredricktown, Mo.		Foster-Heaton Co., Newark, N. J.	
General Platers Supply Co., New York		<b>NICKEL OXIDE, C. P. "BAKER'S ANALYZED"</b>		Seydel Mfg. Co., Jersey City	
Hochmeister - Lind Chem. Co., Pittsburgh		Baker, J. T., Chemical Co., Phil- lipsburg, N. J.	1095	<b>"NILESAP"</b>	
Merck & Co., New York		<b>NICKEL, PERFORATED</b>		McMahan, David, Mfg. Co., Brook- lyn, N. Y.	1119
Rockhill & Victor, New York		Beckley Perforating Co., Garwood, N. J.	345	<b>NITER CAKE</b>	
<b>NICKEL BROMIDE</b>		Multi Metal Co., Inc., New York	714	Butterworth Judson Corp., New York	1102
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<b>NICKEL CARBONATE</b>		<b>NICKEL-SILVER</b>		Davison Chemical Company, Balti- more	1113
Chaplain & Bibbo, New York	1106	Henning, V. & Sons, Bklyn		Du Pont de Nemours, E. I., & Co., Wilmington	1116-1118
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<b>NICKEL CHLORIDE</b>		Will Corporation, Rochester	972-1066	Anderson Phos. & Oil Co., An- derson, S. C.	
Chaplain & Bibbo, New York	1106	Cobalt Chem. Co., New Market, N. J.		Armour Fert. Wks., Chicago	
Cooper, Chas., & Co., New York	1111	Gleason, Chas. H., Chicago		Atlas Powder Co., Wilmington	
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Harshaw Fuller & Goodwin Co., Cleveland	1127	Hochmeister - Lind Chem. Co., Pittsburgh		Coml. Acid Co., St. Louis	
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Powers - Weightman - Rosengarten Co., Philadelphia	1172	Nichols Copper Co., New York		Globe Chem. Co., Cincinnati	
Rossler & Hasselacher Chemical Co., New York	1178-1179	Raritan Copper Wks., Perth Am- boy, N. J.		King Chem. Co., New York	
Will Corporation, Rochester	972-1066	Rockhill & Victor, New York		Lanyon, Robt., Zinc & Acid Co., Hillsboro, Ill.	
<b>NICKEL CHLORIDE, C. P. "BAKER'S ANALYZED"</b>		<b>NICKEL SULFATE, C. P. "BAKER'S ANALYZED"</b>		Lennie, Chas., & Co., Phila.	
Baker, J. T., Chemical Co., Phil- lipsburg, N. J.	1095	Baker, J. T., Chemical Co., Phil- lipsburg, N. J.	1095	Monsanto Chem. Wks., St. Louis	
<b>NICKEL CHROMIUM</b>		<b>NICKEL TUBING.</b> See Tubes, Nickel		Naugatuck Chem. Co., Naugatuck, Conn.	
Driver-Harris Wire Co., Harri- son, N. J.		<b>NICOTINE SULFATE</b>		Nichols Chem. Co., Montreal	
Elec. Alloy Co., Morristown, N. J.		Cooper, Chas., & Co., New York	1111	Orleans Chem. Co., New Orleans	
<b>NICKEL COPPER</b>		Buffalo Nicotine Co., Buffalo		Pa. Powder Co., Emporium, Pa.	
Metz & Theimitt Corp., New York		Victoria Chem. Co., Victoria, B. C.		Sargent, Chas. R. Co., Cleveland	
<b>NICKEL CYANIDE</b>		<b>NIGROSINE BASE</b>		Tenn. Copper Co., Copperhill, Tenn.	
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## OIL, CASTOR, TASTELESS

Kellogg, Spencer, & Sons, Buffalo

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## OIL, CHINA-WOOD

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 Patterson, Boardman & Knapp, New York  
 Patterson, G. W. S., & Co., New York  
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 Sargent, Chas. R., Co., Cleveland  
 Scheel, Wm. H., New York  
 Smead, E. R., Co., Cleveland  
 S. China Develop. Synd., New York  
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 Winterbourne, S., & Co., New York

## OIL, CHLORINOL

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 Doggett, L. C., Co., Chicago  
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 McKesson & Robbins, New York  
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 Philippine Veg. Oil Co., New York  
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 Simon J., & Co., New York  
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 S. China Devel. Synd., New York  
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Klipstein, A., & Co., New York 1143  
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 Sargent, Chas. R., Co., Cleveland  
 S. Fort & Chem. Co., Savannah, Ga.  
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## OIL, COD, SULFONATED

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 Portsmouth Cotton Oil Ref. Corp., Portsmouth, Va.  
 Schaefer Bros. & Powell Mfg. Co., Chicago  
 Standard Dist. & Distrib. Co., Peoria, Ill.  
 Union Starch Ref. Co., Edinburg, Ind.  
 Woolner Dist. Co., Peoria, Ill.

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 Arcadia Cotton Oil Mill & Mfg. Co., Arcadia, Fla.  
 Armstrong Ref. Co., Dallas, Tex.  
 Aspreken & Co., New York  
 Bainbridge Oil Mill, Bainbridge, Ga.  
 Brode, F. W., Co., Memphis  
 Buckeye Cotton Oil Co., Atlanta, Ga.  
 Cook & Swan Co., New York  
 Cotton Seeds Seed & Fert. Co., Macon, Ga.  
 Crescent Cotton Oil Co., Memphis  
 Dallas Oil & Ref. Co., Dallas, Tex.  
 Doggett, L. C., Co., Chicago  
 E. St. Louis Cotton Oil Co., E. St. Louis, Ill.  
 Elbert & Co., New York  
 Farmers' Cotton Oil & Fert. Co., Huntsville, Ala.  
 Fayetteville Oil Co., Fayetteville, Ga.  
 Florida Cotton Oil Co., Jacksonville, Fla.  
 Francesconi, J. C., & Co., New York  
 Fuerst Bros. & Co., New York  
 Globe Soap Co., Cincinnati  
 Greenville Cotton Oil & Mfg. Co., Greenville, Ga.  
 Gulfport Fert. Co., Gulfport, Miss.  
 Hampden Paint & Chemical Co., Boston  
 Hewitt, C. G., Montgomery, Ala.  
 Imperial Cotton Oil Co., Statesville, N. C.  
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 Lange Soap Co., San Antonio, Texas  
 Louisville Cotton Oil Co., Louisville  
 Perkins Oil Co., Memphis  
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## OIL, COTTON-SEED—Con.

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 Omaha Gas Co., Omaha, Neb.  
 U. G. I. Contracting Co., Phila

## OIL, DOG-FISH

Rogers, Brown & Co., Seattle

## OIL, DIP

Barrett Company, New York 1096-1097  
 International Coal Products Corp., New York 1137  
 Jordan, William E., Inc., New York 1141  
 Amer. Chem. & Mfg. Co., Norfolk, Va.  
 Chatfield Mfg. Co., Cincinnati  
 Coopers Creek Chem. Co., W. Conshohocken, Pa.  
 Ill. Oil Co., Rock Island, Ill.

## OIL, DRIP AND HOLDER

Bronx Gas & Electric Co., New York  
 Con. Gas, Elec. Light & Power Co., Balto  
 Fall River Gas Works Co., Fall River, Mass.  
 Lynn Gas & Elec. Co., Lynn, Mass.

## OIL, ELAINE

Rockhill & Vletor, New York

## OIL, EMULSIVE

Apex Chemical Co., Inc., New York 1094

## OIL, BRIGERON

Todd Co., A. M., Kalamazoo

## OIL, ESSENTIAL

Bush, W. J., & Co., Inc., New York 1101  
 Chris, Antoine, Company, New York 1108  
 Cooper, Chas., & Co., New York 1111  
 Fries & Fries Co., Cincinnati 1122  
 Hill, Edward, Son & Co., Inc., New York 1133  
 Jardine, Matheson & Co., New York 1140  
 Klipstein, A., & Company, New York 1143  
 Rhodia Chemical Company, New York 1174  
 Barrett, M. L., & Co., Chicago  
 Barthels Bros., Los Angeles

The Symbol "S" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

**OIL, ESSENTIAL—Con.**

Brown, O. A. Co., New York  
 Bruno, Court, New York  
 Calif Citrus Hy-Prod. Co., Anaheim, Cal  
 Citrus Prod. Co., Redlands, Cal  
 Coffin Redington & Co., San Fran  
 Cie Duval, New York  
 Commonwealth Chem. Corp.,  
 Hoboken, N. J.  
 Dodge & Olcott Co., New York  
 Elson & Brewer, New York  
 Essential Oil Spec. Co., Grass-  
 land, Pa.  
 Fritzsche Bros., New York  
 Fuerst Bros. & Co., New York  
 Gazzola Drug & Chem. Co., Chi-  
 cago  
 Gross, Geo. & Co., New York  
 Helme & Co., New York  
 Hutchison D. W., New York  
 Ising, C. E., Corp., New York  
 Kayser, Henry & Fils, New York  
 Kiehart Synth. Prod. Co., Chicago  
 Lemoine, Pierre, Cie., New York  
 Lueders, Geo. & Co., New York  
 Magnus, Mabec & Reynard, New  
 York  
 Merck & Co., New York  
 Orbus Prod. Trading Co., New  
 York  
 Perfum Prod. Co., New York  
 Pfaltz & Bauer, New York  
 Plymouth Organic Labs., New  
 York  
 Rockhill & Victor, New York  
 Roure-Bertrand Fils, New York  
 Sathness Co., Chicago  
 Sparhawk Charles V., New York  
 Stillwell, A. A. & Co., New York  
 Synflour Scientific Labs., Montic-  
 ello, N. Y.  
 Todd, C. A. M., Kalamazoo,  
 Mich.  
 United Chem. Wks., Corona, Cal  
 Ungerer & Co., New York  
 Van Dyk, E. A., New York  
 Van Dyk & Co., New York  
 Zinkens & Co., New York

**OIL, EUCALYPTUS**

Bush, W. J. & Co., Inc., New York 1101  
 Chris, Antoine, Company, New  
 York 1108  
 Bing, Edw. G. Co., Los Angeles  
 Dodge & Olcott Co., New York  
 Gross, Geo. V. & Co., New York  
 Hill, C. W., Chem. Co., Los An-  
 geles  
 Magnus, Mabec & Reynard, New  
 York  
 Merck & Co., New York  
 Rockhill & Victor, New York

**OIL, EUGENOL. See Oil, Essential****OIL, EXCELSIOR**

Albany Chemical Company, Albany,  
 N. Y. 1087

**OIL, FISH**

Klipstein, A. & Co., New York 1143  
 Clark Fred F. Co., Chicago  
 Cook & Swan Co., New York  
 Francesconi, J. C. & Co., New  
 York  
 Frost, F. W. & Co., New York  
 Job & Co., New York  
 Natl. Oil Prod. Co., Harrison,  
 N. J.  
 Sargent, Chas. R. Co., Cleveland  
 Swan & Finch Co., New York  
 Young, Frank L. Co., New York

**OIL, FLORAL, SYNTHETIC**

Bush, W. J. & Co., New York 1101  
 Chris, Antoine, Company, New  
 York 1108  
 Orbus Prod. Trading Co., New  
 York  
 Synflour Scientific Labs., Montic-  
 ello, N. Y.

**OIL, FLOTATION**

Barber Asphalt Paving Co., Phila-  
 delphia 1098  
 Barrett Company, New York 1096-1097  
 Du Pont de Nemours, E. I. & Co.,  
 Wilmington 1116-1118  
 International Coal Products Corp.,  
 New York 1137  
 Jordan, William E., Inc., New  
 York 1141  
 Amer. Turpentine & Tar Co.,  
 New Orleans  
 Butters, Chas. & Co., Oakland,  
 Cal.  
 Columbia Naval Stores Co., New  
 York  
 Cook & Swan Co., New York  
 Essential Oil Spec. Co., Grass-  
 land, Del.  
 Fla. Industrial Corp., Gaines-  
 ville, Fla.  
 Fla. Wood Prod. Co., Jackson-  
 ville, Fla.  
 Forest Prod. Chem. Co., Memphis

**OIL, FLOTATION—Con.**

Francesconi, J. C. & Co., New  
 York  
 Genl. Naval Stores Co., New  
 York  
 Ga. Pine Turpentine Co., New  
 York  
 Ga. Rosin Prod. Co., Brunswick,  
 Ga.  
 Hochmeister & Land Chem. Co.,  
 Pittsburgh, Pa.  
 Hamilton, Branchamp, Wood-  
 worth, San Fran.  
 Kingsport Wood Reduc. Co., Chi-  
 cago  
 Naval Stores Div., Wilmington  
 Pensacola Tar & Turpentine Co.,  
 Gulf Point, Fla.  
 Protevel Corp., New York  
 Sargent, Chas. R. Co., Cleveland  
 Spiritone Chem. Co., Wilming-  
 ton, N. C.  
 Standard Chem. Co., Tacoma,  
 Wash.  
 Stinson, Equipment Co., Salt  
 Lake City  
 Yaryan Rosin & Turpentine Co.,  
 Brunswick, Ga.

**OIL, FUSEL**

Albany Chemical Co., Albany, N. Y. 1087  
 Alcohol Products Co., New York 1088  
 Bush, W. J. & Co., Inc., New York 1101  
 Chris, Antoine, Company, New  
 York 1108  
 Cooper, Chas. & Co., New York 1111  
 Daigger, A. & Co., Chicago 1128  
 Du Pont de Nemours, E. I. & Co.,  
 Wilmington 1116-1118  
 Heyden Chemical Co., Garfield, N. J. 1131  
 Hummel & Robinson Corp., New  
 York 1135  
 Klipstein, A. & Co., New York 1143  
 Powers - Weightman - Rosengarten  
 Co., Philadelphia 1172  
 Roseville Company, Lawrenceburg,  
 Ind. 1177  
 U. S. Industrial Alcohol Co., New  
 York 1201-1205  
 Amer. Alcohol Co., New York  
 Amer. Dist. Co., Pekin, Ill.  
 Anderson Chem. Co., Passade,  
 N. J.  
 Berg, David, Indus. Alcohol Co.,  
 Phila.  
 Celluloid Zapon Co., New York  
 Federal Prod. Co., Cincinnati  
 Franco Amer. Chem. Wks., Carl-  
 Stadt, N. J.  
 Fuerst Bros. & Co., New York  
 Indus. Dist. Co., Waterloo, N. Y.  
 Mich. Iron & Chem. Co., Chicago  
 Richard & Co., New York  
 Sargent, Chas. R. Co., Cleveland  
 Squibb-Cutter-Squibb Co., Law-  
 renceburg, Ind.  
 Union Dist. Co., Cincinnati  
 Van Schaeck Bros. Chem. Wks.,  
 Chicago  
 W. Indus. Co., Agnew, Cal.  
 Woolner Dist. Co., Peoria, Ill.

**OIL, GERANIUM. See Oil, Essential****OIL, HALIBUT**

Cook & Swan Co., New York  
 Rogers, Brown & Co., Seattle

**OIL, HARDENED. See Oil, Hydrogenated****OIL, HEAVY**

Barrett Company, New York 1096-1097  
 Chatfield Mfg. Co., Cincinnati

**OIL, HERRING**

Klipstein, A. & Co., New York 1143  
 Cook & Swan Co., New York  
 Rogers, Brown & Co., Seattle

**OIL, HORSE**

Amer. Reduc. Co., Pittsburgh

**OIL, HYDROGENATED**

Brown Company, Portland, Me. 1100  
 Procter & Gamble Co., Cincinnati 1173  
 Amer. Oil Prod. Co., Logansport,  
 Ind.

Amer. Oil Treating & Hardening  
 Co., Cincinnati

Cudahy Packing Co., Omaha, Neb.

Great W. Electro Chem. Co., San  
 Fran.

Superior Oil & Process Co.,  
 Portland Ore.

**OIL, JAPAN COD**

Cook & Swan Co., New York  
 Rogers, Brown & Co., Seattle

**OIL, JASMINE. See Oil, Essential****OIL, KETONE. See Oil, Acetone****OIL, LARD**

Wilson & Co., Chicago 1211  
 Adams, Fred C., Co., Chicago  
 Animal Oil Co., Phila.  
 Armour & Co., Chicago  
 Cook & Swan Co., New York  
 Cudahy Packing Co., Omaha, Neb.  
 Davies, Wm., Co., Toronto

**OIL, LARD—Con.**

Fancourt, W. F. & Co., Phila.  
 Malone Oil Co., Cleveland  
 Moore Oil Co., Cincinnati  
 Morris & Co., Chicago  
 Natl. Oil Prod. Co., Harrison, N. J.  
 Swan & Finch Co., New York  
 Swift Can. Co., W. Toronto  
 Swift & Co., Chicago  
 Wilson-Martin Co., Phila.

**OIL, LAVENDER. See Oil, Essential****OIL, LEATHER**

Apex Chemical Co., Inc., New York 1094  
 Merrick & Voigt, New York 1129  
 Klipstein, A. & Co., New York 1143  
 Amer. Chem. Prod. Co., Newark,  
 N. J.  
 Atwood Mfg. Co., New York  
 Atlantic Ref. Co., Phila.  
 Atlas Ref. Co., Newark, N. J.  
 Drew, F. E. & Co., New York  
 Emery Mfg. Co., Bradford, Pa.  
 Francesconi, J. C. & Co., New  
 York  
 Houghton, E. F. & Co., Phila.  
 Natl. Oil Prod. Co., Harrison,  
 N. J.  
 Natl. Oil & Supply Co., Newark,  
 N. J.

Snyder Mfg. Co., Jersey City  
 United Chem. Prod. Corp., Jer-  
 sey City  
 Yecum-Eaust, London, Ont.

**OIL, LEMON. See Oil, Essential****OIL, LIGHT**

Barrett Co., New York 1096-1097  
 Smet-Solvay Company, Syracuse 1182-1183

Amer. Tar Prod. Co., Chicago  
 Armitage Mfg. Co., Richmond,  
 Va.  
 Bethlehem Steel Co., S. Bethle-  
 hem, Pa.  
 Brockton Gas Light Co., Brock-  
 ton, Mass.  
 By Prod. Coke Corp., Chicago  
 Cons. Gas Co., New York  
 Consumers Gas Co., Toronto  
 Des Moines Gas Co., Des Moines  
 Jacksonville Gas Co., Jackson-  
 ville, Fla.  
 New Bedford Gas & Edison Light  
 Co., New Bedford, Mass.  
 N. Shore Gas Co., Waukegan, Ill.  
 Peoples Light Co., Davenport, Ia.  
 Rochester Railway & Light Co.,  
 Rochester  
 Sioux Falls Gas Co., Sioux Falls,  
 S. D.  
 Spokane Gas & Fuel Co., Spo-  
 kane, Wash.  
 Utica Gas & Elec. Co., Utica,  
 N. Y.

**OIL, LINSEED**

Alta Linseed Oil Co., Medicine  
 Hat, Alta.  
 Amer. Linseed Co., New York  
 Brandram-Henderson, Montreal  
 Can. Paint Co., Winnipeg, Man.  
 Dom. Linseed Oil Co., Baden,  
 Ont.  
 Fredonia Linseed Co., Fredonia,  
 Wis.  
 Grove Linseed Oil Co., Phila.  
 Hamenstein & Co., Buffalo  
 Hirst & Begley Linseed Wks.,  
 Chicago  
 Kellogg, Spencer, & Sons, Buffalo  
 Kellogg & Miller, Amsterdam,  
 N. Y.  
 Lewis & Bros. Co., John T.,  
 Phila.  
 Malone Oil Co., Cleveland  
 Midland Linseed Prod. Co.,  
 Minneapolis  
 Minn. Linseed Oil Co., Minne-  
 apolis  
 Natl. Lead Co., New York  
 Natl. Lead & Oil Co., Pittsburgh  
 N. Linseed Oil Co., Minneapolis  
 Orr, W. P., Linseed Oil Co.,  
 Plaquemine, O.  
 Pacific Oil & Lead Works, San  
 Fran.  
 Portland Linseed Oil Wks., Port-  
 land, Ore.  
 Sargent, Chas. R. Co., Cleveland  
 Sherwin-Williams Co., Cleveland  
 Sioux City Linseed Oil Wks.,  
 Sioux City, Ia.

**OIL, LUBRICATING, "GENASCO"**

Barber Asphalt Paving Co., Phila-  
 delphia 1098

**OIL, LUBRICATING, TEXTILE**

Apex Chemical Co., Inc., New York 1094

**OIL, LUBRICANT AND MACHINE**

Cook's, Adam, Sons, New York 412

**OIL, MAIZE. See Oil, Corn****OIL, MENHADEN**

Klipstein, A. & Company, New  
 York 1143  
 Atlas Refinery, Newark, N. J.

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<b>OIL, MINERAL—Con.</b>					
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♦Bent, Jas. S., Boston					
Cook & Swan Co., New York					
Dodd, A. W. & Co., Gloucester, Mass.					
♦Goldsmith, Simon M., New York					
Robinson, W. A. & Co., New Bedford, Mass.					
Swan & Finch Co., New York					
<b>OIL, MINERAL, WATER WHITE</b>					
Orbis Prod. Trading Co., New York					
Standard Oil Co. of N. J., New York					
<b>OIL, MONOPOLE</b>					
Wolf, Jacques & Company, Passaic, N. J.					
Natl. Oil Prod. Co., Harrison, N. J.	1212				
<b>OIL, MONOSULFOL</b>					
Natl. Oil Prod. Co., Harrison, N. J.					
<b>OIL, MUGUET.</b> See Oil, Essential					
<b>OIL, MUSTARD.</b> See Oil, Essential					
<b>OIL, MYRSANE.</b> See Oil, Essential					
<b>OIL, NEATSFOOT</b>					
Marshaw Fuller & Goodwin Co., Cleveland	1127				
Wilson & Co., Chicago	1211				
Animals Oil Co., Phila.					
Atlas Ref., Newark, N. J.					
Comp. Rend. Co., Boston					
Cook & Swan Co., New York					
Cudahy Packing Co., Omaha, Neb.					
Davies, Wm., Co., Toronto					
Fairbank, N. K. Co., Chicago					
Fancourt, W. F. & Co., Phila.					
Harding, H. N., Phila.					
Joslin-Schmidt Co., Cincinnati					
Malone Oil Co., Cleveland					
Morris & Co., Chicago					
Natl. Oil Prod. Co., Harrison, N. J.					
Pacific Coast Provision Co., Los Angeles					
Rohm & Haas Co., Phila.					
Sargent, Chas. R. Co., Cleveland					
Swan & Finch Co., New York					
Wilson-Martin Co., Phila.					
Yocum-Faust, London, Ont.					
Young, Frank L. Co., New York					
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Bush, W. J. & Co., Inc., New York	1101				
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Orbis Prod. Trading Co., New York					
Roure-Reitrand Fils, New York					
<b>OIL, OLBO</b>					
Wilson & Co., Chicago	1211				
Armour & Co., Chicago					
Comp. Rend. Co., Boston					
Cudahy Packing Co., Omaha, Neb.					
Francesconi, J. C. & Co., New York					
Morris & Co., Chicago					
Swift & Co., Chicago					
Wilson-Martin Co., Phila.					
<b>OIL, OLIVE</b>					
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Croschwaite, Ralph L. Co., New York	1112				
Klipstein, A. & Co., New York	1143				
Beebe Chem. Co., New York					
Bredt, F. & Co., New York					
Burroughs, Jas. S. & Co., New York					
Cook & Swan Co., New York					
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Fuerst Bros. & Co., New York					
Garrigues, Chas. F. Co., New York					
Hampden Paint & Chem. Co., Boston					
Jordan, W. H. & F., Phila.					
Lehn & Pink, New York					
Lueders, Geo. & Co., New York					
McKesson & Robbins, New York					
Magnus, Maboe & Reynard, New York					
Miller Mfg. Co., Providence					
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Klipstein, A. & Co., New York	1143				
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<b>OIL, PAINT</b>					
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Garrigues, Chas. F. Co., New York					
Jordan, W. H. & F., Phila.					
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Welch, Holme & Clark Co., New York					
Young, Frank L. Co., New York					
<b>OIL, PARA</b>					
Herrick & Voigt, New York	1129				
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♦Anderson & Gustafson, Chicago					
Atlantic Ref. Co., Phila.					
Canfield Oil Co., Cleveland					
Clarendon Ref. Co., Clarendon, Pa.					
Constantin Ref. Co., Tulsa, Okla.					
Cosden & Co., Tulsa, Okla.					
Crew Levick Co., Phila.					
Emery Mfg. Co., Bradford, Pa.					
Empire Ref. Inc., Tulsa, Okla.					
Fiske Bros. Ref. Co., New York					
Francesconi, J. C. & Co., New York					
Gulf Ref. Co., Pittsburgh					
Imperial Oil Co., Toronto					
Island Petroleum Co., Pittsburgh					
Louisiana Oil Ref. Corp., Shreveport, La.					
Muskogee Ref. Co., Muskogee, Okla.					
Natl. Petroleum Prod. Co., Chicago					
Ohio Valley Ref. Co., St. Marys, Va.					
Okmulgee Prod. & Ref. Co., Okmulgee, Okla.					
Pan-American Ref. Co., Tulsa, Okla.					
Penn. Amer. Ref. Co., Oil City, Pa.					
Pa. Ref. Co., Kansas City, Pa.					
Sapulpa Ref. Co., Sapulpa, Okla.					
Sinclair Ref. Co., Chicago					
Sloan & Zook, Bradford, Pa.					
Standard Oil Co. of N. J., New York					
Stoddard Oil Co., Chicago					
Swan & Finch Co., New York					
Texas Co., New York					
Tidewater Oil Co., New York					
Warren Ref. Co., Warren, Pa.					
Waverly Oil Wks. Co., Pittsburgh					
<b>OIL, PEACH-KERNEL.</b> See Oil, Essential					
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Jardine, Matheson & Co., New York	1140				
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Amer. Cotton Oil Co., New York					
Aspreken & Co., New York					
♦Bartlett & Co., M. L., Chicago					
♦Bleeker, Rutger & Co., New York					
♦Doggett, L. C. Co., Chicago					
Cook & Swan Co., New York					
Fidelity Cotton Oil Co., Houston, Tex.					
Francesconi, J. C. & Co., New York					
Frost, F. W. & Co., New York					
Fuerst Bros. & Co., New York					
Internat. Veg. Oil Co., Atlanta, Ga.					
Kellogg, Spencer & Sons, Buffalo, Tex.					
Lange Soap Co., San Antonio, Tex.					
Magnolia Provision Co., Houston, Tex.					
Portsmouth Cotton Oil Ref. Corp., Portsmouth, Va.					
Rockhill & Victor, New York					
S. China Dezel Synd., New York					
S. Cotton Oil Co., New York					
S. Oils & Feed Mills, Petersburg, Va.					
Standard Chem. & Oil Co., Troy, Ala.					
Trinity Cotton Oil Co., Dallas, Tex.					
<b>OIL, PENETROL</b>					
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<b>OIL, PEPPERMINT.</b> See Oils, Essential					
<b>OIL, PERILLA</b>					
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Curry, Frank S. Co., San Fran.					
Doggett, L. C. Co., Chicago					
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Nagase, D. & Co., New York					
Rockhill & Victor, New York					
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Columbia Naval Stores Co., New York					
Fla. Indus. Corp., Gainesville, Fla.					
Fla. Wood Products Co., Jacksonville, Fla.					
Forest Prod. Co., New Orleans					
♦Freeman, John R., Chicago					
Genl. Naval Stores Co., New York					
Ga. Lumber & Turpentine Co., Cutting, Ga.					
Ga. Pine Turpentine Co., New York					
Ga. Rosin Prod. Co., Brunswick, Ga.					
Greeley Prod. Corp., New York					
Gulf Naval Stores Supply Co., New Orleans					
Naval Stores Div., Wilmington					
Newport Turpentine & Rosin Co., Milwaukee					
Pa. Ref. Co., Phila.					
Pensacola Tar & Turpentine Co., Gulf Point, Fla.					
Pine Nene Prod. Co., Jacksonville, N. C.					
Spiritine Chem. Co., Wilmington, N. C.					
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Taylor, Lowenstein & Co., Mobile, Ala.					
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Ga. Rosin Prod. Co., Brunswick, Ga.					
Pensacola Tar & Turpentine Co., Gulf Point, Fla.					
Pine Nene Prod. Co., Jacksonville, N. C.					
Sargent, Chas. R. Co., Cleveland					
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Frost, F. W. & Co., New York					
Garrigues, Chas. F. Co., New York					
Jardine, Matheson & Co., New York					
Kellogg, Spencer & Sons, Buffalo					
Kuhn & Volk, E. S. Co., New York					
Malone Oil Co., Cleveland					
Oil Seeds Co., New York					
Sargent, Chas. R. Co., Cleveland					
Sonneborn, L. Sons, New York					
Swan & Finch Co., New York					
♦Zinkelsen & Co., New York					
<b>OIL, RECOVERED, SOYA, CASTOR AND PEANUT</b>					
Kellogg, Spencer & Sons, Buffalo					
<b>OIL, RED.</b> See Acid, Oleic					
<b>OIL, RED, SAPONIFIED</b>					
Celina Stearic Acid Co., Celina, O.					
♦Fancourt, W. F. & Co., Phila.					
Harness & Cowing Co., Cincinnati					
Morris & Co., Chicago					
<b>OIL, RICINOLA</b>					
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<b>OIL, ROMOPOLE</b>					
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<b>OIL, ROSE.</b> See Oil, Essential					

The Symbol "♦" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12



Mentioning this catalog when writing firms enables us to give you a better reference work next year.  
For List of Scientific and Technical Books, see page 1215

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Heinmann Chem. Co., Olean, N. Y.		Kellogg, H. W. Co., New York.....	822-823	Frost, F. W., & Co., New York	
Kinzler Valley Chem. Co., Williamsport, Pa.		Sowers Mfg. Co., Buffalo.....	840-843	Kenart Synth. Prod. Co., Chicago	
Michigan Chem. Co., Williamsport, Pa.				Organic Prod. Corp., Schenectady	
Mich. Iron & Chem. Co., Chicago		<b>OIL MANOGRARY RED</b>		<b>OILERS, AUTOMATIC, PNEU-MATIC</b>	
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Quinn Labs. Co., Olean, N. Y.		Klipstein, A., & Co., New York.....	1143		
Standard Chem. Co., Toronto		Metz, H. A., & Co., New York.....	1154	<b>OLEIC ACID.</b> See Acid, Oleic	
Vandah Chem. Co., Olean, N. Y.		Amer. Color Mfg. Co., Passaic, N. J.		<b>"OLEITE"</b>	
<b>OIL, WOOD, PREPARED</b>		Central Dyestuff & Chem. Co., Newark, N. J.		Oleite Corp., New York	
Boehm, Fredk., Ltd., New York		Foster-Heaton Co., Newark, N. J.		<b>OLEO MARGARINE PLANTS.</b> See Margarine Plants	
<b>OIL WOOL</b>		Holland Aniline Co., Holland, Mich.		<b>OLEO PLANT EQUIPMENT</b>	
Herrick & Voigt, New York	1129	Stubner Chem. Wks., Elizabeth, N. J.		Allbright-Neill Co., Chicago	260
Klipstein, A., & Co., New York	1143	<b>OIL MILL MACHINERY</b>		Dopp, H. W. Co., Buffalo	840-843
Wolf, Jacques, & Co., Passaic, N. J.	1212	Allbright-Neill Co., Chicago	260	Garrigue, William, & Company, Chicago and New York	496-501
Aratol Mfg. Co., New York		Anderson, V. D., Co., Cleveland	290-291	Sowers Mfg. Co., Buffalo	840-843
Atlantic Ref. Co., Phila.		Carver, Fred S., New York	387	<b>OLEO RESINS</b>	
Drew, E. F., & Co., New York		Corbett, Geo. E., Boiler & Tank Co., Chicago	416	Bush, W. J., & Co., Inc., New York	1101
Fancourt, W. F., & Co., Phila.		Dopp, H. W. Co., Buffalo	840-843	Chirig, Antoine, Co., New York	1108
Harding, H. C., Phila.		Garrigue, William, & Company, Chicago and New York	496-501	Kenart Synth. Prod. Co., Chicago	
Houghton, E. F., & Co., Phila.		Jeffrey Manufacturing Co., Columbus, O.	606-607	Macnus, Mabce & Reynard, New York	
Kali Mfg. Co., Phila.		Link-Belt Company, Chicago	667	Orbis Prod. Trading Co., New York	
Moore Oil Ref. Co., Cincinnati		Louisville Drying Machinery Co., Louisville	670	Unicer & Co., New York	
Natl. Oil Prod. Co., Harrison, N. J.		Robinson Mfg. Co., Muncy, Pa.	809	<b>OLEO-STEARIN.</b> See Stearin, Oleo	
Seydel Mfg. Co., Jersey City		Sowers Mfg. Co., Buffalo	840-843	<b>OLEUM.</b> See Acid, Sulfuric, Fuming	
Sonneborn, L. Sons, New York		Sprout, Waldron & Co., Muncy, Pa.	818	<b>"OLIVER" CONTINUOUS FILTER.</b>	
Swan & Finch Co., New York		Vogt, Henry, Machine Company, Louisville	926-927	Oliver Continuous Filter Co., San Francisco and New York	736-739
Yocum-Paust, London, Ont.		Weller Manufacturing Co., Chicago	941	<b>OMOROL</b>	
<b>OIL, WOOL PULLING</b>		Buckeye Iron & Brass Wks., Dayton, O.		Heyden Chemical Co., Garfield, N. J.	1131
Herrick & Voigt, New York	1129	Cardwell Mach. Co., Richmond, Va.		<b>ONE-BATH TANNAGE.</b> See Tanning, One-Bath	
<b>OIL, WORMWOOD.</b> See Oil, Essential		French Oil Mill Mach. Co., Phila.		<b>OPAL BLUE</b>	
<b>OIL, YLANG-YLANG.</b> See Oil, Essential		Hydraulic Press Mfg. Co., Mt. Gilead, O.		Cosmos Chemical Co., Plainfield, N. J.	
<b>OIL BLACK</b>		Perrin, Wm. R., & Co., Chicago		<b>OPTICAL GLASSES</b>	
Heller & Mers Co., New York	1128	Van Atta, E. H., Co., Olean, N. Y.		Bausch & Lomb Optical Co., Rochester	340-341
Klipstein, A., & Co., New York	1143	<b>OIL ORANGE</b>		Corning Glass Works, Corning, N. Y.	418
Metz, H. A., & Co., New York	1154	Heller & Mers Co., New York	1128	<b>OPTICAL INSTRUMENTS.</b> See also Laboratory Apparatus	
Amer. Color Mfg. Co., Passaic, N. J.		Klipstein, A., & Co., New York	1143	Bausch & Lomb Optical Co., Rochester	340-341
Central Dyestuff & Chem. Co., Newark, N. J.		Metz, H. A., & Co., New York	1154	Elmer & Amend, New York	457
Foster-Heaton Co., Newark, N. J.		Central Dyestuff & Chem. Co., Newark, N. J.		Will Corporation, Rochester	972-1066
Seydel Mfg. Co., Jersey City		Foster-Heaton Co., Newark, N. J.		Gaertner, Wm., & Co., Chicago	
Stubner Chem. Wks., Elizabeth, N. J.		Frost, F. W., & Co., New York		Scientific Materials Co., Pittsburgh	
<b>OIL BLACK WALNUT</b>		Kenart Synth. Prod. Co., Chicago		<b>ORANGE A.</b> See Acid Orange A	
Foster-Heaton Co., Newark, N. J.		Stubner Chem. Wks., Elizabeth, N. J.		<b>ORANGE G</b>	
<b>OIL BLEACHING PLANTS</b>		<b>OIL ORANGE EXTRA</b>		Klipstein, A., & Co., New York	1143
Garrigue, William, & Company, Chicago and New York	496-501	Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	Metz, H. A., & Co., Inc., New York	1154
<b>OIL BLUE, LIQUID</b>		<b>OIL PINK</b>		Central Dyestuff & Chem. Co., Newark, N. J.	
Heller & Mers Co., New York	1128	Foster-Heaton Co., Newark, N. J.		<b>ORANGE GG</b>	
Metz, H. A., & Co., New York	1154	<b>OIL RECOVERY APPARATUS.</b> See Extractors, Oil		Sherwin-Williams Co., Cleveland	
Central Dyestuff & Chem. Co., Newark, N. J.		<b>OIL RED</b>		<b>ORANGE GGR</b>	
<b>OIL BLUE B</b>		Heller & Mers Co., New York	1128	Peerless Color Co., Bound Brook, N. J.	
Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	Klipstein, A., & Co., New York	1143	<b>ORANGE I</b>	
Foster-Heaton Co., Newark, N. J.		Metz, H. A., & Co., New York	1154	Chaplain & Bibbo, New York	1106
<b>OIL BLUE-BLACK</b>		Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	Metz, H. A., & Co., Inc., New York	1154
Foster-Heaton Co., Newark, N. J.		Central Dyestuff & Chem. Co., Newark, N. J.		Central Dyestuff & Chem. Co., Newark, N. J.	
<b>OIL BROWN</b>		Foster-Heaton Co., Newark, N. J.		Kenart Synth. Prod. Co., Chicago	
Heller & Mers Co., New York	1128	Frost, F. W., & Co., New York		Heath Mtr. Co., St. Louis	
Klipstein, A., & Co., New York	1143	Kenart Synth. Prod. Co., Chicago		Hord Color Products Co., Sandusky	
Metz, H. A., & Co., New York	1154	<b>OIL REFINING MACHINERY, EDIBLE OILS</b>		<b>ORANGE II.</b> See Acid Orange II	
Central Dyestuff & Chem. Co., Newark, N. J.		Allbright-Neill Co., Chicago	260	<b>ORANGE Y</b>	
Foster-Heaton Co., Newark, N. J.		Anderson, V. D., Co., Cleveland	290-291	Metz, H. A., & Co., Inc., New York	1154
Frost, F. W., & Co., New York		Garrigue, William, & Company, Chicago and New York	496-501	Central Dyestuff & Chem. Co., Newark, N. J.	
Kenart Synth. Prod. Co., Chicago		Lummas, Walter E. Co., Boston	674-681	Sherwin-Williams Co., Cleveland	
<b>OIL BURNING INSTALLATIONS</b>		Vogt, Henry, Machine Company, Louisville	926-927	<b>ORANGE CRYSTALS</b>	
White Fuel Oil Eng. Corp., New York	965	<b>OIL SCARLET</b>		National Aniline & Chemical Co., Inc., New York	1159
<b>OIL BURNERS.</b> See Burners, Oil		Heller & Mers Co., New York	1128	<b>ORANGE MINERAL</b>	
<b>OIL, CHERRY</b>		Klipstein, A., & Co., New York	1143	Eagle-Picher Lead Co., Chicago	1119
Foster-Heaton Co., Newark, N. J.		Metz, H. A., & Co., New York	1154	Matheson Lead Co., Long Island City, N. Y.	
<b>OIL DEODORIZING PLANTS.</b> See Deodorizers, Oil and Fat		Newport Chemical Works, Inc., Passaic, N. J.	1164-1165	<b>ORE CARES.</b> See Cars, Ore	
<b>OIL EXTRACTION APPARATUS.</b> See Extractors, Oil		Central Dyestuff & Chem. Co., Newark, N. J.		<b>ORE CONCENTRATING EQUIPMENT.</b> See specific headings	
<b>OIL FILTERING SYSTEMS</b>		Foster-Heaton Co., Newark, N. J.		<b>ORE FLOTATION PLANTS.</b> See Flotation Machines	
Anderson, V. D., Co., Cleveland	290-291	<b>OIL SPRAYERS, "TURBO"</b>		<b>ORE ROASTING PLANTS</b>	
Cellite Products Co., New York	388-389	Parks-Cramer Company, Fitchburg, Mass.	750	Herrshoff Furnace Dept., General Chemical Co., New York	555
Koven, L. O., & Brother, Jersey City, N. J.	651	<b>OIL TESTING APPARATUS.</b> See Testers, Oil		Pacific Foundry Co. (Herrshoff Furnace Dept.), San Fran.	555
Bowen, S. F., & Co., Ft. Wayne, Ind.		<b>OIL, VIOLET</b>		Perry & Webster, Inc., New York	760-761
Mechanical Mfg. Co., Chicago		Foster-Heaton Co., Newark, N. J.		Denver Fire Clay Co., Denver, Colo.	
Nugent, Wm. W., Co., Chicago		<b>OIL, WALNUT</b>		<b>ORES, RARE</b>	
Pittsburgh Gage & Supply Co., Pittsburgh		Foster-Heaton Co., Newark, N. J.		Crosthwaite, Ralph L., Co., New York	1112
Richardson-Phenix Co., Milwaukee, Wis.		<b>OIL YELLOW</b>		Johnson, Matthey & Co., New York	618
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<b>OIL GREEN</b>		Klipstein, A., & Co., New York	1143		
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Lamie Chem. Co., Huntington, W. Va.					
<b>OIL HYDROGENATION PLANTS.</b> See Hydrogenation Plants					

The Symbol "☐" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

Mentioning this catalog when writing firms enables us to give you a better reference work next year.  
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OXYGEN GAS TESTING APPARATUS		PACKINGS, ASBESTOS		PACKINGS, METALLIC—Con.	
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International Oxygen Co., Newark, N. J.	597	Goetze Gasket & Packing Co., New Brunswick, N. J.	527	Simmons, John, Co., New York	
Will Corporation, Rochester, N. Y.	972-1066	Janos Asbestos Co., New York	604	Steel Mill Packing Co., Detroit	
OSOKERITE		Keasbey & Mattison Co., Ambler, Pa.	619	PACKING, PAPER FIBER, "FE-TROLA"	
Lamson, John S., & Bro., New York	1146	Norristown Magnesia & Asbestos Co., Norristown, Pa.	730	Belmont Packing & Rubber Co., Philadelphia	346
Union Chemical Co., Boston	1198	PACKINGS, AUTOCLAVE		PACKINGS, PISTON	
Amer. Chem. & Ozokerite Co., Chicago		American Huhn Metallic Packing Co., New York	270	American Huhn Metallic Packing Co., New York	270
Christal, Chas. B., New York		Goetze Gasket & Packing Co., New Brunswick, N. J.	527	Belmont Packing & Rubber Co., Philadelphia	346
Hachmeister - Lind Chem. Co., Pittsburgh		PACKINGS, BELMONT		Goetze Gasket & Packing Co., New Brunswick, N. J.	527
Morningstar, R. F., New York		Belmont Packing & Rubber Co., Philadelphia	346	Janos Asbestos Co., New York	604
Salomon, L. A., & Bro., New York		PACKINGS, CARBON DIOXIDE		New York Belting & Packing Co., New York	725
Smith & Nichols, New York		American Huhn Metallic Packing Co., New York	270	Norristown Magnesia & Asbestos Co., Norristown, Pa.	730
OSONATORS		Goetze Gasket & Packing Co., New Brunswick, N. J.	527	Sarco Co., Inc., New York	819
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OSONE PLANTS		American Huhn Metallic Packing Co., New York	270	American Huhn Metallic Packing Co., New York	270
General Electric Co., Schenectady	508-517	Goetze Gasket & Packing Co., New Brunswick, N. J.	527	Belmont Packing & Rubber Co., Philadelphia	346
Research Corporation, New York	803	PACKINGS, CONDENSER		Goetze Gasket & Packing Co., New Brunswick, N. J.	527
Sprague Electric Works, New York	847	Goetze Gasket & Packing Co., New Brunswick, N. J.	527	Janos Asbestos Co., New York	604
PAOCO DYE STUFFS		Wheeler Condenser & Eng. Co., Carteret, N. J.	963	New York Belting & Packing Co., New York	725
Pakath Aniline & Chem. Corp., Boston		PACKINGS, FLAX		Norristown Magnesia & Asbestos Co., Norristown, Pa.	730
PACKAGE FILLERS AND PACKERS		Janos Asbestos Co., New York	604	Sarco Co., Inc., New York	819
Abbe, Paul O., Inc., New York	241-245	Simmons, John, Co., New York		PACKINGS, RUBBER	
American Machinery Co., Philadelphia	272	PACKING, FIBER		Belmont Packing & Rubber Co., Philadelphia	346
Day, J. K., Co., Cincinnati	151	Diamond State Fibre Co., Bridgeport, Pa.	435	Janos Asbestos Co., New York	604
Pneumatic Scale Corp., Norfolk Downs, Mass.	770-771	PACKINGS, "GOETZE"		Jenkins Bros., New York	608-611
PACKING MACHINES, CARTONS AND CANS		Goetze Gasket & Packing Co., New Brunswick, N. J.	527	Manhattan Rubber Mfg. Co., Passaic, N. J.	690
Pneumatic Scale Corp., Norfolk Downs, Mass.	770-771	PACKINGS, HIGH PRESSURE		New York Belting & Packing Co., New York	725
PACKERS, FLOUR, BRAN, ETC.		American Huhn Metallic Packing Co., New York	270	Norristown Magnesia & Asbestos Co., Norristown, Pa.	730
Sprout, Waldron & Co., Muncy, Pa.	818	Belmont Packing & Rubber Co., Philadelphia	346	United States Rubber Co., New York	918-919
PACKING HOUSE BY-PRODUCT PLANTS. See Abattoir By-Product Equipment		Goetze Gasket & Packing Co., New Brunswick, N. J.	527	General Asbestos & Rubber Co., Charleston, S. C.	
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Allbright-Well Co., Chicago	260	Jenkins Bros., New York	608-611	Simmons, John, Co., New York	
American Process Company, New York	276	Manhattan Rubber Mfg. Co., Passaic, N. J.	690	PACKINGS, SHEET	
Corbett, Geo. E., Boiler & Tank Co., Chicago	116	New York Belting & Packing Co., New York	725	Belmont Packing & Rubber Co., Philadelphia	346
Dopp, E. W., Co., Buffalo	810-843	Norristown Magnesia & Asbestos Co., Norristown, Pa.	730	Goetze Gasket & Packing Co., New Brunswick, N. J.	527
Elyria Enamelled Products Company, Elyria, Ohio	466	Sarco Co., Inc., New York	819	Janos Asbestos Co., New York	604
Jeffrey Manufacturing Co., Columbus, O.	606-607	United States Rubber Co., New York	918-919	Jenkins Bros., New York	608-611
Link-Bell Company, Chicago	667	Wood, E. D., & Co., Philadelphia	1070-1071	New York Belting & Packing Co., New York	725
Sowers Mfg. Co., Buffalo	840-843	PACKINGS, HYDRAULIC		Norristown Magnesia & Asbestos Co., Norristown, Pa.	730
Weller Mfg. Co., Chicago	941	American Huhn Metallic Packing Co., New York	270	Sarco Co., Inc., New York	819
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American Huhn Metallic Packing Co., New York	270	Keasbey & Mattison Co., Ambler, Pa.	619	Duriron Company, Dayton, O.	450-453
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Goetze Gasket & Packing Co., New Brunswick, N. J.	527	New York Belting & Packing Co., New York	725	Genesee Chem. Co., Batavia, N. Y.	
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Keasbey & Mattison Co., Ambler, Pa.	619	Van Atta, E. B., & Company, Inc., Olean, N. Y.	922	Eclipse Air Brush Co., Newark, N. J.	456
Manhattan Rubber Mfg. Co., Passaic, N. J.	690	Watson-Stillman Co., New York	939	Eureka Machine Co., Cleveland	469
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Norristown Magnesia & Asbestos Co., Norristown, Pa.	730	PACKINGS, LEATHER		Eclipse Air Brush Co., Newark, N. J.	456
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Norristown Magnesia & Asbestos Co., Norristown, Pa.	730	PACKINGS, METALLIC		Barber Asphalt Paving Co., Philadelphia	1098
United States Rubber Co., New York	918-919	American Huhn Metallic Packing Co., New York	270	General Bakelite Co., New York	502
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		Goetze Gasket & Packing Co., New Brunswick, N. J.	527	Jordan, William B., Inc., New York	1141
		Sarco Co., Inc., New York	819	Marshall Nichols, Inc., Baltimore	692
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PAINTS, ANTI-CYANIDE		Fries & Fries Co., Cincinnati	1122	Palatine Aniline & Chem. Corp., Boston	
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Herrick & Voigt, New York	1129
<b>PENETROMETERS</b>	
Dalger, A., & Co., Chicago	428
Elmer & Amend, New York	457
Will Corporation, Rochester	972-1066
<b>PENSTOCKS</b>	
Biehl Iron Works, Reading, Pa.	354
Chattanooga Boiler & Tank Co., Chattanooga	391
Chicago Bridge & Iron Works, Chicago	399
Coatesville Boiler Works, Coatesville, Pa.	408
Corbett, Geo. E., Boiler & Tank Co., Chicago	416
Dover Boiler Works, New York	439
Downingtown Iron Works, Inc., Downingtown, Pa.	445
Hodge Boiler Works, East Boston, Mass.	564
International Engineering Works, Inc., Framingham, Mass.	594-595
Kellogg, M. W., Co., New York	622-623
Lebanon Boiler Works, Lebanon, Pa.	662
Newbold, E. S., & Sons Co., Norristown, Pa.	722
New York Central Iron Works Co., Hagerstown, Md.	726
Oldman Boiler Works, Buffalo	740
Petty, J. E., & Co., Philadelphia	662
Pittsburgh-Des Moines Steel Co., Pittsburgh	769
Stearns, A. T., Lumber Co., Boston	856
Struthers-Wells Co., Warren, Pa.	864-865
Tippett & Wood, Philadelphia	891
Warren City Tank & Boiler Co., Warren, O.	937
<b>PENSTOCKS, FORGE WELDED</b>	
Kellogg, M. W., Co., New York	622-623
<b>PENTANE</b>	
Ohio Fuel Supply Co., Columbus	
<b>PENTACHLOROETHANE</b>	
Dow Chemical Co., Midland, Mich.	1114
Moessler & Hasslacher Chemical Co., New York	1178-1179
Synthetic Laboratories of Chicago, Chicago	1191
<b>PEPSIN</b>	
Wilson & Co., Chicago	1211
Digestive Ferments Co., Detroit	

The Symbol "♦" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12



PEPTONE	PAGE	PHARMACEUTICAL CHEMICALS—	PAGE	PHENYLACETALDEHYDE—Con.	PAGE
Wilson & Co., Chicago.....	1211	Con.		Kenart Synth. Prod. Co., Chicago	
Digestive Ferments Co., Detroit		Massengill, S. E. Co., Bristol, Tenn.		Orbis Prod. Trading Co., New York	
<b>PHENYLCHLOROSTYRENE</b>		Merck & Co., New York		Standard Chem. Co., Bayonne, N. J.	
Roesler & Haaslach Chem. Co., New York	1178-1179	Merrill, Wm. S. Co., Cincinnati		Van Dyk & Co., New York	
<b>PHENOLATORS</b>		Monsanto Chem. Wks., St. Louis		<b>PHENYLACETATE</b>	
Acid Proof Clay Products Co., Akron, O.	248	N. Y. Quinine & Chem. Wks., New York		Elmer & Amend, New York	428
Badger, E. B., & Sons Co., Boston	310-329	Organic Prod. Corp., Schenectady		Dow Chemical Co., Midland, Mich.	1114
Bartlett, C. O., & Snow Co., Cleveland	338	Organic Salt & Acid Co., New York		Synthetical Laboratories of Chicago, Chicago	1191
Day, J. H. Co., Cincinnati	431	Parke Davis & Co., Detroit		Will Corporation, Rochester	972-1066
Detroit Heating & Lighting Co., Detroit	433	Seydel Mfg. Co., Jersey City		<b>PHENYLACETATE OF ETHYL ESTER</b>	
General Ceramics Company, New York	504-507	Stearns, Fred., & Co., Detroit		Ising, C. E., Corp., Flushing, N. Y.	
Glander & Co., Newark, N. J.	524-525	Takamine Lab., New York		<b>PHENYLALANINE</b>	
Green Mfg. Co., Chicago	538	<b>PHARMACEUTICAL MACHINERY</b>		Synthetical Laboratories of Chicago, Chicago	1191
Knight, Maurice A., East Akron, O.	638-649	Baker Sons & Perkins Co., Joseph, White Plains, N. Y.	333	<b>PHENYL BENZOATE</b>	
Kopperman, Jos., & Sons, Philadelphia	650	Colton, Arthur, Company, Detroit	409	Synthetical Laboratories of Chicago, Chicago	1191
Koven, L. O., & Brother, Jersey City, N. J.	651	Day, J. H., Company, Cincinnati	431	<b>PHENYLPHENYLHYDRAZINE</b>	
Lummas, Walter E., Co., Boston	674-681	Stokes, F. J., Machine Co., Philadelphia	858-860	Synthetical Laboratories of Chicago, Chicago	1191
Ott, Joseph, & Sons, Philadelphia	735	Werner & Pfleiderer Co., White Plains, N. Y.	942-943	<b>PHENYL CHLORIDE</b>	
Ott, George F., Co., Philadelphia	744	<b>PHENACETINE</b> . See Acetophenetidine		Kilpstein, A., & Co., New York	1143
Rosa, Chas. A., Inc., New York	810	<b>PHENANTHRENE</b>		<b>PHENYLDIMETHYLPYRACOLONE</b>	
Stokes, F. J., Machine Co., Philadelphia	858-860	Barrett Company, New York	1096-1097	Rhodia Chemical Company, New York	1174
Welded Steel Barrel Corp., Detroit	433	<b>PHENO BLACK</b>		<b>PHENYLETHYL ACETATE</b>	
Will Corporation, Rochester	972-1066	Heller & Mers Co., New York	1128	Chiris, Antoine, Company, New York	1108
<b>PERFORATED METAL</b> . See Metals, Perforated		<b>PHENO BLUE</b>		Ising, C. E., Corp., Flushing, N. Y.	
<b>PERMANENT RED</b>		Heller & Mers Co., New York	1128	Synthetical Scientific Labs., Monticello, N. Y.	
May Chem. Wks., Newark, N. J.		<b>PHENO BROWN</b>		<b>PHENYLETHYL ALCOHOL</b> . See Alcohol, Phenylethyl	
<b>"PERMUTIT" PRODUCTS</b>		Heller & Mers Co., New York	1128	<b>PHENYLETHYL FORMATE</b>	
Permutit Company, New York	758	<b>PHENO GREEN</b>		Van Dyk & Co., New York	
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<b>PETRI DISHES</b> . See Dishes, Petri		<b>PHENO ORANGE</b>		Van Dyk & Co., New York	
<b>PETROGRAPHIC APPARATUS</b>		Heller & Mers Co., New York	1128	<b>PHENYLETHYL VALERIATE</b>	
Bausch & Lomb Optical Co., Rochester, N. Y.	340-341	<b>PHENO VIOLET</b>		Van Dyk & Co., New York	
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<b>"PETROHOL" (ISOPROPYL ALCOHOL)</b>		<b>PHENO YELLOW</b>		Kilpstein, A., & Co., New York	1143
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<b>PETROLATUM</b>		Barrett Company, New York	1096-1097	Synthetical Laboratories of Chicago, Chicago	1191
Union Chemical Co., Boston	1198	Chaplain & Bibbo, New York	1106	Amer. Nitration Co., Nutley, N. J.	
Atlantic Ref. Co., Phila.		Cooper, Chas., & Co., New York	1111	Atlantic Dyestuff Co., Boston	
Standard Oil Co. of N. Y., New York		Dow Chemical Co., Midland, Mich.	1114	Chem. Co. of Amer., New York	
Texas Co., New York		Heyden Chemical Co., Garfield, N. J.	1131	Frost, F. W., & Co., New York	
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<b>PETROLEUM DISTILLATES</b> . See Petroleum Products		Jordan, William E., Inc., New York	1141	Monroe Color & Chem. Co., Quincy, Ill.	
<b>PETROLEUM DISTILLATES RECOVERY PLANTS</b>		Kilpstein, A., & Co., New York	1143	Verona Chem. Co., N. Newark, N. J.	
Badger, E. B., & Sons Co., Boston	310-329	National Aniline & Chemical Co., New York	1159	<b>PHENYLENEDIAMINE, PARA-Gaskill Chemical Corp., Brooklyn</b>	1123
Lummas, Walter E., Co., Boston	674-681	Newport Chemical Works, Inc., Passaic, N. J.	1161-1165	Kilpstein, A., & Co., New York	1143
<b>PETROLEUM ETHER</b>		Powers - Weightman - Rosengarten Co., Philadelphia	1172	National Aniline & Chemical Co., Inc., New York	1159
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Atlantic Ref. Co., Phila.		Semet-Solvay Company, Syracuse	1182-1183	Tower Manufacturing Co., New York	1196
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<b>PETROLEUM GAS (IN CYLINDERS)</b>		Allen Chem. Co., Allentown, Pa.		Essex Aniline Wks., Boston	
Continental Gas Comp. Corp., New York		Amer. Synth. Color Co., Stamford, Conn.		Merck & Co., New York	
Pittsburgh Thermoline Co., Pittsburgh		Baker, H. J., & Bro., New York		Seydel Mfg. Co., Jersey City	
Rockgas Prod. Co., Pittsburgh		Campbell, John, & Co., New York		Sherwin-Williams Co., Cleveland	
<b>PHARMACEUTICAL CHEMICALS</b>		Chatfield Mfg. Co., Cincinnati		United Chem. Prod. Corp., Jersey City	
Albany Chemical Company, Albany, N. Y.		Chattanooga Chem. Co., Chattanooga		<b>PHENYLENEDIAMINE, PARA-HYDROCHLORIDE</b>	
Bush, W. J., & Co., Inc., New York	1087	Coopers Creek Chem. Co., W. Conshohocken, Pa.		Gaskill Chemical Corp., Brooklyn	1123
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Cooper, Chas., & Co., New York	1111	Greiff, R. W., & Co., New York		<b>PHENYLGLYCOLACETAL</b>	
Heyden Chemical Co., Garfield, N. J.	1131	Hampden Paint & Chem. Co., Boston		Van Dyk & Co., New York	
Kalbfleisch Corporation, New York	1142	Lewis, F. J., Mfg. Co., Chicago		<b>PHENYLHYDRAZINE</b>	
Kilpstein, A., & Co., New York	1143	Merck & Co., New York		Elmer & Amend, New York	428
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Marshall Richa, Inc., Baltimore	692	New England Mfg. Co., Boston		Synthetical Laboratories of Chicago, Chicago	1191
Mets, H. A., & Co., Inc., New York	1154	Stanley Aniline Chem. Wks., Lock Haven, Pa.		Will Corporation, Rochester	972-1066
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Pfizer, Chas., & Co., New York	1170	U. G. I. Contracting Co., Phila.		<b>PHENYLHYDRAZINE ACETATE</b>	
Rhodia Chemical Co., New York	1174	White Tar Co., New York		Synthetical Laboratories of Chicago, Chicago	1191
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Warner Chemical Company, New York	1209	LaMotte Chemical Products Co., Baltimore	1144-1145	Gaskill Chemical Corp., Brooklyn	1123
Will Corporation, Rochester	972-1066	Will Corporation, Rochester	972-1066	Chem. Prod. Corp., Milwaukee	
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Abbott Labs., Chicago		LaMotte Chemical Products Co., Baltimore	1144-1145	Synthetical Laboratories of Chicago, Chicago	1191
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Ames Chem. Wks., Glens Falls, N. Y.		Will Corporation, Rochester	972-1066	Chaplain & Bibbo, New York	1106
Bristol-Myers Co., Bklyn		Greiff, R. W., & Co., New York		Elmer & Amend, New York	428
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Kremer Urban Co., Milwaukee		Seydel Mfg. Co., Jersey City		Kenart Synth. Prod. Co., Chicago	
Lilly, Eli, & Co., Indianapolis		<b>PHENYLACETALDEHYDE</b>		<b>PHENYLPROPYL ACETATE</b>	
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		Fries & Fries Co., Cincinnati	1122	<b>PHENYL SALICYLATE</b>	
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PHOSPHATE OF SODA. See Sodium Phosphate		Will Corporation, Rochester	972-1066	May Chem. Wks., Newark, N. J.	
PHOSPHATE HANDLING MACHINERY. See also Conveyors and Elevators		Baker, H. J. & Bro., New York		Sherwin-Williams Co., Cleveland	
Guarantee Construction Co., New York	540-541	Secaw Chem. Co., Irvington, N. J.		PIGMENT MILLS. See Mills, Color	
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Link-Belt Company, Chicago	667	Warner Chemical Company, New York	1209	PILING MACHINERY, PORTABLE	
Malcolmson Engineering & Machine Corp., Chicago	687	Will Corporation, Rochester	972-1066	Brown Portable Conveying Machinery Co., Chicago	371
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Armour Fert. Wks., Chicago		Will Corporation, Rochester	972-1066	Weller Manufacturing Co., Chicago	941
Baker, H. J. & Bro., New York		R. I. V. Co., New York		PILING, STEEL	
Bell Chem. Co., Louisville		PHOTOENGRAVERS' MACHINERY		American Car & Foundry Co., New York	264
International Agric. Corp., New York		Moyle, John, & Sons, Paterson, N. J.	815	PILL MACHINES, AUTOMATIC	
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Va.-Car. Chem. Co., Richmond, Va.		PHOTOGRAPHIC LENSES		PINACONE HYDRATE	
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Bunting Brass & Bronze Co., Toledo, O.		Glass Specialty Co., Newark, N. J.	523	PINTSCH GAS	
Damascus Bronze Co., Pittsburgh		Griebel Instrument Co., Carbon-dale, Ill.	547	Pintsch Compressing Co., New York	
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Riverside Metal Co., Riverside, N. J.		Movay Instrument & Chemical Co., Buffalo	814	Abernethy, John F., Brooklyn, N. Y.	246
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Tottenville Copper Co., Tottenville, N. Y.		Scientific Utilities Co., New York	826-827	American Foundry & Construction Co., Pittsburgh	266-267
PHOSPHOR-COPPER		Standard Calorimeter Co., East Moline, Ill.	849	Andrews Lead Co., Long Island City, N. Y.	285
Moessler & Hasselacher Chemical Co., New York	1178-1179	Standard Scientific Co., New York	852	Blaw-Knox Co., Pittsburgh	358-361
Ajax Metal Co., Phila.		Will Corporation, Rochester	972-1066	Duriron Company, Dayton, O.	450-453
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Lang, R. F., New York		Standard Calorimeter Co., East Moline, Ill.	849	Hoyt Metal Company, St. Louis	577
Metal & Thermit Co., New York		PHOTOMICROGRAPHIC APPARATUS		Kellogg, M. W. Co., New York	622-623
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PHOSPHOR-TIN		Brooklyn Thermometer Co., Brooklyn, N. Y.	368	Lummas, Walter E., Co., Boston	674-681
Ajax Metal Co., Phila.		Claffin, Geo. L., Co., Providence	105	Luzerne Rubber Company, Trenton, N. J.	673
Electric Smelt & Aluminum Co., Lockport, N. Y.		Elmer & Amend, New York	457	Michigan Pipe Company, Bay City, Mich.	702
Empire Metal Co., Syracuse		Glass Specialty Co., Newark, N. J.	523	Pacific Tank & Pipe Co., San Francisco	745
Lang, R. F., New York		Marshall Miha, Inc., Baltimore	692	Reading Iron Co., Reading, Pa.	796-797
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PHOSPHORUS, RED AND YELLOW		Scientific Instrument Co., New York	825	PIPE, ALUMINUM	
Campbell, C. W., Chemicals, New York	1103	Scientific Utilities Co., New York	826-827	Aluminum Co. of America, Pittsburgh	
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Colgate Chem. Products Co., New York		Will Corporation, Rochester	972-1066	Whitlock Coll. Pipe Co., Hartford, Conn.	966-967
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Gr. W. Smelt & Ref. Co., Chicago		PTHALIC ANHYDRIDE		York Manufacturing Co., York, Pa.	1080
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Eagle-Picher Lead Co., Chicago	1119
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United Lead Co., New York	911-915

## PIPE, BRASS

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Acme Copper-smithing Co., Chicago	249
American Foundry & Construction Co., Pittsburgh	266-267
Bridgeport Brass Co., Bridgeport, Conn.	365
Clow, James B. & Sons, Chicago	497
Green Mfg. Co., Chicago	538
Oakland Copper & Brass Works, Oakland, Cal.	732-733
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh	766-768
Simmons Pipe Bending Works, Newark, N. J.	834
Vendome Copper & Brass Works, Louisville, Ky.	923
Whitlock Coil Pipe Co., Hartford, Conn.	966-967

## PIPE, "BYERS GENUINE WROUGHT IRON"

Simmons Pipe Bending Works, Newark, N. J.	834
Byers, A. M. Co., Pittsburgh	

## PIPE, CAST-IRON

American Car & Foundry Co., New York	264
American Foundry & Construction Co., Pittsburgh	266-267
Buffalo Foundry & Machine Co., Buffalo	371-379
Chicago Bridge & Iron Works, Chicago	399
Clow, James B. & Sons, Chicago	497
Coatesville Boiler Works, Coatesville, Pa.	408
Dougherty, M. J. Co., Philadelphia	442-443
Glamorgan Pipe & Foundry Co., Lanham, Va.	520-521
Grinnell Company, Inc., Providence	532-536
Lancaster Iron Works, Inc., Lancaster, Pa.	656-657
Nordberg Mfg. Co., Milwaukee	728-729
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh	766-768
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## PIPE, CHEMICAL LEAD

Andrews Lead Co., Long Island City, N. Y.	287
United Lead Co., New York	911-915

## PIPE, COPPER

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Bridgeport Brass Co., Bridgeport, Conn.	365
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Keller, George, Copper Works, Brooklyn, N. Y.	621
Kopperman, Jos. & Sons, Philadelphia	659
Liberty Copper-smithing Co., Philadelphia	666
Lummas, Walter B. Co., Boston	674-681
National Pipe Bending Co., New Haven, Conn.	716
Oakland Copper & Brass Works, Oakland, Cal.	732-733
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Foxboro Co., Inc., Foxboro, Mass.	490
Schaeffer & Budenberg Mfg. Co., Brooklyn	820
Thwing Instrument Co., Philadelphia	890
Uehling Instrument Co., New York	904
<b>RECORDERS, VACUUM.</b> See Recorders, pressure	
<b>RECORDERS, WATER LEVEL.</b> See Recorders, Liquid Level	
<b>RECOVERERS, ALCOHOL</b>	
Barnstead Still & Sterilizer Co., Boston	335
<b>RECOVERY APPARATUS.</b> See specific heads	
<b>RECOVERY OF DUST AND FUME FROM GASES.</b> See Dust Collectors, also Precipitation Apparatus, Electrical	
<b>RECOVERY OF WASTE PRODUCTS</b>	
Note—Some of the firms in this list are prepared to undertake the recovery of any kind of waste product, others specialize on the waste products from certain particular industries. Time will be saved by consulting their pages before corresponding.	
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Hercules Engineering Corp., New York	556-559
Koven, L. O., & Bro., Jersey City	651
Lewis, Green, McAdams & Knowland, Boston	664
Lewis Recovery Corporation, Boston	665
Little, Arthur D., Inc., Cambridge, Mass.	668
Lummas, Walter E., Co., Boston	674-681
Mantius Engineering Co., Inc., New York	688-689
Meads, Richard E., & Co., Baltimore	696
Melgs, Bassett & Slaughter, Inc., Philadelphia	697

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Perry & Webster, Inc., New York	760-761	Kohnstamm, H. & Co., New York			
Provoost Engineering Corp., New York	788	Lasher, F. G. & Co., Inc., New York		<b>REELS, BOLTING</b>	
Research Corporation, New York	803	Sargent, Chas. R. & Co., Cleveland		Abbe Engineering Co., New York	250-254
Scott, Ernest & Co., Fall River, Mass.	828			Abbe, Paul O., New York	241-245
				Bartlett, C. O. & Snow Co., Cleveland	338
<b>RECOVERY PLANTS, ACID.</b> See Acid Recovery Apparatus		<b>RED, TURKEY</b>	428	Multi Metal Co., Inc., New York	714
<b>RECOVERY PLANTS, CAUSTIC</b>		Daigger, A. & Co., Chicago	1130	Robinson Mfg. Co., Muncy, Pa.	809
Mantius Engineering Co., Inc., New York	688-689	Herrmann, Morris, & Co., New York	1150	Simpson, Orville, Co., Cincinnati	835
		McNulty, Joseph A., New York	1208	Sprout, Waldron & Co., Muncy, Pa.	848
Meigs, Bassett & Slaughter, Inc., Philadelphia	697	Waldo, E. M. & F., New York			
<b>RECOVERY PLANTS, DUST.</b> See Dust Collecting Systems		Kohnstamm, H. & Co., New York		<b>REELS, BOLTING, "CENTRIFUGAL"</b>	
<b>RECOVERY PLANTS, FATTY ACID</b>		Lasher, F. G. & Co., Inc., New York		Simpson, Orville, Co., Cincinnati	835
Garrigue, William, & Company, Chicago and New York	496-501	Mephum, Geo. S. & Co., E. St. Louis, Ill.		<b>REFINING APPARATUS.</b> See specific heads	
<b>RECOVERY PLANTS, GAS</b>		Sargent, Chas. R. & Co., Cleveland		<b>REFINING PLANTS, ELECTROLYTIC</b>	
Electrochemical Supply & Eng. Co., Philadelphia	460	<b>RED, TUSCAN</b>		American Lead Burning Corp., New York	271
<b>RECOVERY PLANTS, GASOLINE</b>		McNulty, Joseph A., New York	1150	Electro-Chemical Supply & Engineering Co., Philadelphia	460
Hope Engineering & Supply Co., Mt. Vernon, O.	572	Waldo, E. M. & F., New York	1208	<b>"REFINITE" PRODUCTS</b>	
<b>RECOVERY PLANTS, PAPER MILL</b>		Mephum, Geo. S. & Co., E. St. Louis, Ill.		Refinite Company, Omaha, Neb.	801
Cannon-Swenson Co., Chicago	384-385	Richard-Coulston, New York		<b>REFLECTOR FIXTURES</b>	
Mantius Engineering Co., Inc., New York	688-689	<b>REDS, ROSINE</b>		Benjamin Electric Mfg. Co., Chicago	347
		Union Chemical Co., Boston	1198	Ivanhoe-Regent Works of G. E. Co., Cleveland	601
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Meigs, Bassett & Slaughter, Inc., Philadelphia	697	Daigger, A. & Co., Chicago	428	Benjamin Electric Mfg. Co., Chicago	347
Newbold, E. B. & Sons Co., Norristown, Pa.	722	Herrmann, Morris, & Co., New York	1130	Corning Glass Works, Corning, N. Y.	418
Scott, Ernest & Co., Fall River, Mass.	828	Waldo, E. M. & F., New York	1208	Ivanhoe-Regent Works of G. E. Co., Cleveland	601
<b>RECOVERY PLANTS, POTASH</b>		Ansbacher A. B. & Co., New York		<b>REFLECTORS, ALUMINUM</b>	
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<b>RECOVERY PLANT, SOLVENTS, INFLAMMABLE.</b> See Solvent Recovery Apparatus		Waldo, E. M. & F., New York	1208	<b>"REFORM" THERMOMETERS.</b> See Thermometer, "Reform"	
<b>RECOVERY PLANTS, WOOL GREASE</b>		Ansbacher A. B. & Co., New York		<b>REFRACTOMETER, DIPPING</b>	
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Scott, Ernest & Co., Fall River, Mass.	828	Eagle Printing Ink Co., New York		<b>REFRACTOMETERS.</b> See Laboratory Apparatus and Supplies	
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Westinghouse Electric & Mfg. Company, East Pittsburgh	946-961	Sargent, Chas. R. & Co., Cleveland		Celite Products Company, New York	388-389
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<b>"RECTOR, G. F. E." HEATING SYSTEMS</b>		Acme Copper Smelting Co., Chicago	249	National Sales Co., Cincinnati	1741
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<b>RED, BROWN</b>		Bethlehem Foundry & Machine Co., South Bethlehem, Pa.	353	Surface Combustion Co., New York	874-875
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McNulty, Joseph A., New York	1150	Cruse-Kemper Company, Ambler, Pa.	425	Morton Co., Worcester, Mass.	731
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Pennsylvania Salt Mfg. Co., Philadelphia	1169	Dopp, H. W., Co., Buffalo	840-843	Laclede-Christy Clay Products Co., St. Louis	654
<b>RED LEAD.</b> See Lead, Red		Groen Mfg. Co., Chicago	538	<b>REFRACTORY FIRE CLAY AND DUST.</b> See Clay Refractory	
<b>RED OIL.</b> See Acid Oleic		Hercules Engineering Corporation, New York	556-579	<b>"REFRAX"</b>	
<b>RED OXIDE.</b> See Iron Oxide, Red		Jacoby, Henry E., New York	603	Carborundum Co., Niagara Falls	
<b>RED PRECIPITATE</b>		Kellogg, M. W., Co., New York	622-623	<b>REFRIGERATING ENGINEERS.</b> See Engineers, Refrigerating	
Powers - Weightman-Rosengarten Co., Philadelphia	1172	Kopperman, Jos. & Sons, Philadelphia	650	<b>REFRIGERATING MACHINERY, AMMONIA SYSTEM</b>	
<b>RED, PROCESS</b>		Koven, L. O. & Bro., Jersey City, N. J.	651	Arctic Ice Machine Company, Canton, Ohio	294
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<b>RED PRUSSIAN OF SODA.</b> See Sodium Ferrieyanide		Newbold, E. B. & Sons Co., Norristown, Pa.	722	Hope Engineering & Supply Co., Mt. Vernon, O.	572
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		Jones, W. A. Foundry & Machine Co., Chicago	614-615		
		<b>REDUCERS, WORM GEAR</b>			
		Jones, W. A. Foundry & Machine Co., Chicago	614-615		
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<b>RUBBER BELTING.</b> See Belting, Rubber		Amer. Rutile Co., Washington, D. C.		Amer. Metal Co., New York	
<b>RUBBER BUFFING MACHINES.</b> See Buffing Machines, Rubber		Roote Mineral Co., Phila.		Amer. Zinc & Chem. Co., New York	
<b>RUBBER CEMENTS.</b> See Cement, Rubber		<b>S BENDS.</b> See Bends, S		Atlas Powder Co., Wilmington	
<b>RUBBER CEMENT MACHINERY</b>		<b>SACCHARIMETERS</b>		Barbour Chem. Wks., San Fran.	
American Tool & Machine Co., Boston	282-283	New York Thermometer Co., New York	727	Barada, Gordon & Page, Kansas City	
Baker Sons & Perkins Co., Jos., White Plains, N. Y.	333	Will Corporation, Rochester	972-1066	Central Chem. Co., Chicago	
Dopp, E. W., Co., Buffalo	840-843	<b>SACCHARINE, INSOLUBLE AND SOLUBLE</b>		Chinchfield Prod. Corp., New York	
Sowers Mfg. Co., Buffalo	840-843	Heyden Chemical Co., Garfield, N. J.	1131	Contact Process Co., Buffalo	
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<b>RUBBER CHIPPERS.</b> See Chippers, Rubber		Rhodia Chemical Company, New York	1174	Mineral Point Zinc Co., Chicago	
<b>RUBBER COMPOUNDS</b>		Rossler & Haaslach Chemical Co., New York	1178-1179	Monsanto Chem. Wks., St. Louis	
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<b>RUBBER, CRUDE</b>		Carus Chem. Co., La Salle, Ill.		N. J. Zinc Co., New York	
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American Hard Rubber Co., New York	268-269	Heyden Chemical Co., Garfield, N. J.	1131	Stauffer Chem. Co., San Fran.	
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<b>SAMPLING MACHINERY</b>			Ott, George F., Co., Philadelphia	714		Will Corporation, Rochester	972-1066	
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Sturtevant Mill Company, Boston	870-871		Werner & Pfleiderer Co., White Plains, N. Y.	942-943		Shore Instrument Co., New York		
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Pa. Puly Co., Lewistown, Pa.			Toledo Scale Co., Toledo, O.	894-895		Elmer & Amend, New York	457	
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Dings Magnetic Separator Co., Milwaukee	438	Dorr Company, New York	440-441	American Brass Co., Waterbury, Conn.	263
Magnetic Manufacturing Co., Milwaukee	686	SEWAGE DISPOSAL	440-441	Bridgeport Brass Co., Bridgeport, Conn.	365
SEPARATORS, MAGNETIC		SHADES, ALUMINUM		SHEETS, CHEMICAL LEAD	
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Magnetic Manufacturing Co., Milwaukee	686	SHADES, GLASS		United Lead Co., New York	911-915
Robinson Mfg. Co., Muncy, Pa.	809	Ivanhoe-Regent Works of G. E. Co., Cleveland	601	SHEETS, FIBER	
Sprout, Waldron & Co., Muncy, Pa.	818	SHADES, STEEL		Diamond State Fibre Co., Bridgeport, Pa.	435
SEPARATORS, MAGNETIC FULLEY "HIGH DUTY"		Ivanhoe-Regent Works of G. E. Co., Cleveland	601	SHEETS, FLEXIBLE, RUBBER COMPOSITION	
Magnetic Manufacturing Co., Milwaukee	686	SHAFTING		Belmont Packing & Rubber Co., Philadelphia	346
SEPARATORS, MAGNETIC TYPES "F" AND "L"		American Tool & Machine Co., Boston	282-283	Jenkins Bros., New York	608-611
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SEPARATORS, MAGNETIC, WET		Caldwell, H. W., & Son Co., Chicago	381	United States Rubber Company, New York	918-919
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SEPARATORS, METAL		Jeffrey Manufacturing Co., Columbus, O.	606-607	American Brass Co., Waterbury, Conn.	263
Dings Magnetic Separator Co., Milwaukee	438	Latimer, Robert L., Co., Philadelphia	661	SHEETS, HARD RUBBER	
Magnetic Manufacturing Co., Milwaukee	686	Link-Belt Company, Chicago	667	York Hard Rubber Co., New York	268-269
SEPARATORS, MOISTURE	See Separators, Steam	Robinson Mfg. Co., Muncy, Pa.	809	Luzerne Rubber Company, Trenton, N. J.	673
SEPARATORS, OIL		Simpson, Orville, Co., Cincinnati	835	United States Rubber Co., New York	918-919
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Anderson, V. D., Co., Cleveland	290-291	Weller Manufacturing Co., Chicago	941	Diamond State Fibre Co., Bridgeport, Pa.	435
Crane Co., Chicago	420-421	SHAKERS, BOTTLE		SHEETS, LEAD	
National Pipe Bending Co., New Haven, Conn.	719	Brooklyn Thermometer Co., Brooklyn, N. Y.	368	Andrews Lead Co., Long Island City, N. Y.	287
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh	766-768	Clafin, Geo. L., Co., Providence	405	Hoyt Metal Company, St. Louis	577
Provost Engineering Corp., New York	788	Eimer & Amend, New York	457	Union Smelting & Refining Co., New York	905
Wright-Austin Co., Detroit	1077	Glass Specialty Co., Newark, N. J.	523	United Lead Co., New York	911-915
Blackburn-Smith Corp., New York	1077	Griebl Instrument Co., Inc., Carbondale, Pa.	537	SHEETS, MANGANESE BRONZE	
Obrite Corp., New York		International Equipment Co., Boston	596	American Brass Co., Waterbury, Conn.	263
Open Coil Heater & Purifier Co., Indianapolis		Marshall Richa, Inc., Baltimore	692	SHEETS, METAL, ASBESTOS, PROTECTED	
Simmons, John, Co., New York		Palo Company, New York	719	Robertson, H. H., Company, Pittsburgh	806-808
Sims Co., Erie, Pa.		Rovey Instrument & Chemical Co., Buffalo	814	SHEETS, METAL, CORRUGATED	
SEPARATORS, OIL, VEGETABLE		Scientific Utilities Co., Inc., New York	826-827	Robertson, H. H., Company, Pittsburgh	806-808
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Newbold, E. S., & Sons Co., Norristown, Pa.	722	Wickwire Spencer Steel Corp., Worcester, Mass.	970-971	SHEETS, RUBBER	
Pittsburgh Valve, Foundry & Construction Co., Pittsburgh	766-768	SHEAVES		Belmont Packing & Rubber Co., Philadelphia	346
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Vilter Manufacturing Co., Milwaukee	924	Fuller-Lehigh Company, Fullerton, Pa.	492-493	United States Rubber Co., New York	918-919
U. S. & Cuban Allied Works Engineering Corp., New York	920	Hales, George, Mfg. Co., New York	542-543	SHEETS, STEEL, LEAD-COATED	
Watson & McDaniel Co., Philadelphia	938	Jones, W. A., Foundry & Machine Co., Chicago	614-615	United Lead Company, New York	911-915
Whitlock Oil Pipe Co., Hartford	970-971	Latimer, Robert L., & Co., Philadelphia	661	SHEETS, TIN	
Wright-Austin Co., Detroit	1077	Sprout, Waldron & Co., Muncy, Pa.	818	Hoyt Metal Company, St. Louis	577
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Mitchell, W. K., & Co., Philadelphia	703	Weller Manufacturing Co., Chicago	941	American Brass Co., Waterbury, Conn.	263
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McMeekan, David, Mfg. Co., Brooklyn	1149		Apex Chemical Co., Inc., New York	1094				
SIMONSON - MANTUIS SLUDGE ACID, RECOVERY PROCESS			Hummel & Robinson Corp., New York	1135				
American Lead Burning Co., New York	271		Klipstein, A., & Co., New York	1143				
Mantius Engineering Co., New York	688-689		Malt-Diastase Company, New York	1151				
SINGING MACHINES, GAS			McMeekan, David, Mfg. Co., Brooklyn	1149				
Textile-Finishing Machinery Co., Providence	884		Philadelphia Quartz Co., Philadelphia	1171				
Curtis & Marble Mach. Co., Worcester, Mass.			Wolf, Jacques & Company, Passaic, N. J.	1212				
Improved Appliance Co., Bklyn.			Arabol Mfg. Co., New York					
SINKS, LABORATORY			Beaver Chem. Co., Damascus, Va.					
Alberene Stone Co., New York	258-259		Bloede, V. G. Co., Baltimore					
Duriron Company, New York	450-453		Bosson & Lane, Atlantic, Mass.					
General Ceramics Co., New York	504-507		Dewey & Almy Chem. Co., Cambridge, Mass.					
Knight, Maurice A., E. Akron, O.	638-649		Dextro Prod., Inc., Buffalo					
Peterson, Leonard & Company, Inc., Chicago	759		Ducas, B. P. Co., New York					
SINTERING PLANT EQUIPMENT			Fancourt, W. F., & Co., Phila.					
Bartlett, C. O., & Snow Co., Cleveland	338		Jack, Louis, Co., New York					
			Leyland, Thos., & Co., Boston					
			Morningstar, Chas., & Co., New York					
			Natl. Oil Prod. Co., Harrison, N. J.					
			Onyx Oil & Chem. Co., Jersey City					
			Seydel Mfg. Co., Jersey City					
			Springfield Chem. Prod. Co., Springfield, Mass.					
			Sykes & Co., Walter F., New York					
			United Chem. Prod. Corp., Jersey City					
			United Chem. & Organic Prod. Co., Chicago					

The Symbol "Ⓢ" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12





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Will Corporation, Rochester	972-1066		National Robin Oil & Sise Co., New York	1160		Apex Chemical Co., Inc., New York	1094	
Amer. Metal Co., New York			Union Chemical Co., Boston	1198		Mummel & Robinson Corp., New York	1135	
Ames Chem. Wks., Glen Falls, N. Y.						Klipstein, A., & Co., New York	1143	
Merck & Co., New York			SIZING, "EXCELSIOR"			Malt-Diastase Company, New York	1151	
Savell & Frost, Niagara Falls			Wolf, Jacques & Company, Passaic, N. J.	1212		McMeekan, David, Mfg. Co., Brooklyn	1149	
SILVER CYANIDE			SIZINGS FOR COTTON			Wolf, Jacques & Company, Passaic, N. J.	1212	
Cooper, Chas., & Co., New York	1111		Apex Chemical Co., Inc., New York	1094		Arabol Mfg. Co., New York		
Powers - Weightman - Rosengarten Co., Philadelphia	1172		Merrick & Voigt, New York	1129		Beaver Chemical Co., Damascus, Va.		
Rosessler & Hasslacher Chemical Co., New York	1178-1179		Mummel & Robinson Corp., New York	1135		Bloede, V. G. Co., Baltimore		
Will Corporation, Rochester	972-1066		Klipstein, A., & Co., New York	1143		Bosson & Lane, Atlantic, Mass.		
Ames Chem. Wks., Glen Falls, N. Y.			McMeekan, David, Mfg. Co., Brooklyn	1149		Dewey & Almy Chem. Co., Cambridge, Mass.		
Savell & Frost, Niagara Falls			Malt-Diastase Company, New York	1151		Dextro Prod., Inc., Buffalo		
SILVER, GRANULATED			Wolf, Jacques & Company, Passaic, N. J.	1212		Ducas, B. P. Co., New York		
Cooper, Chas., & Co., New York	1111					Fancourt, W. F., & Co., Phila.		
Ames Chem. Wks., Glen Falls, N. Y.			Arabol Mfg. Co., New York			Feculose Co., Ayer, Mass.		
SILVER IODIDE			Beaver Chem. Co., Damascus, Va.			Jack, Louis, Co., New York		
Albany Chemical Co., Albany, N. Y.	1087		Bosson & Lane, Atlantic, Mass.			Leyland, Thos., & Co., Boston		
Cooper, Chas., & Co., New York	1111		Dewey & Almy Chem. Co., Cambridge, Mass.			Morningstar, Chas., & Co., New York		
Ames Chem. Wks., Glen Falls, N. Y.			Dextro Prod., Inc., Buffalo			Natl. Oil Prod. Co., Harrison, N. J.		
SILVER METAL, PRECIPITATED			Fancourt, W. F., & Co., Phila.			Onyx Oil & Chem. Co., Jersey City		
Cooper, Chas., & Co., New York	1111		Feculose Co. of Amer., Ayer, Mass.			Royal Chem. Co., Harris, R. I.		
Powers - Weightman - Rosengarten Co., Philadelphia	1172		Leyland, Thos., & Co., Boston			Seydel Mfg. Co., Jersey City		
SILVER NITRATE			Morningstar, Chas., & Co., New York			Springfield Chem. Prod. Co., Springfield, Mass.		
Albany Chemical Co., Albany, N. Y.	1087		Natl. Gum & Mica Co., New York			Sykes & Co., Walter F., New York		
Cooper, Chas., & Co., New York	1111		Natl. Oil Prod. Co., Harrison, N. J.			Trojan Textile Chem. Co., New York		
Drakenfeld, E. F., & Co., Inc., New York	1115		Onyx Oil & Chem. Co., Jersey City			United Chem. Prod. Corp., Jersey City		
Powers - Weightman - Rosengarten Co., Philadelphia	1172		Royal Chem. Co., Harris, R. I.			United Chem. & Organic Prod. Co., Chicago		
Will Corporation, Rochester	972-1066		Seydel Mfg. Co., Jersey City					
Ames Chem. Wks., Glen Falls, N. Y.			Springfield Chem. Prod. Co., Springfield, Mass.			SIZING APPLIANCES, "BEPURT"		
Buchanan, C. G., Chem. Co., Cincinnati			Sykes & Co., Walter F., New York			Process Eng., Inc., New York		
Hachmeister - Lind Chem. Co., Pittsburgh			Trojan Textile Chem. Co., New York			SKATOLE		
McCurdy, H. W., Toronto			United Chem. Prod. Corp., Jersey City			Synthetic Laboratories of Chicago, Chicago	1191	
Merck & Co., New York			United Chem. & Organic Prod. Co., Chicago			Van Dyk & Co., New York		
Natl. Drug & Chem. Co., Montreal						SKELP		
Savell & Frost, Niagara Falls						Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa.	548-549	
SILVER NITRATE, C. P. "BAKER'S ANALYZED"			SIZINGS FOR PAPER			SKIMMERS		
Baker, J. T., Chemical Co., Phillipsburg, N. J.	1095		Apex Chemical Co., Inc., New York	1094		Yarnall-Waring Co., Philadelphia	1079	
SILVER NUCLEINATE			Mummel & Robinson Corp., New York	1135		Dixon, Jos., Crucible Co., Jersey City, N. J.		
Reyden Chemical Co., Garfield, N. J.	1131		Klipstein, A., & Co., New York	1143		SKIMMERS, BOILER		
Digestive Ferments Co., Detroit			McMeekan, David, Mfg. Co., Brooklyn	1149		Yarnall-Waring Co., Philadelphia	1079	
SILVER ORES			Philadelphia Quartz Co., Philadelphia	1171		SKINS, RAW AND DRESSED		
Amer. Metal Co., New York			Arabol Mfg. Co., New York			Jardine, Matheson & Co., New York	1140	
SILVER OXIDE			Beaver Prod. Co., New York			SKIP HOISTS. See Hoists, Skip		
Drakenfeld, E. F., & Co., Inc., New York	1115		Bloede, V. G. Co., Baltimore			SKIPS		
SILVER PROTEINATE			Bosson & Lane, Atlantic, Mass.			Bartlett, C. O., & Snow Co., Cleveland	338	
Digestive Ferments Co., Detroit			Dewey & Almy Chem. Co., Cambridge, Mass.			Columbia Hoist & Crane Co., Long Island City, N. Y.	410	
Greiff, R. W., & Co., New York			Dextro Prod., Inc., Buffalo			Jeffrey Manufacturing Co., Columbus, Ohio	606-607	
SILVER, REFINERS OF			Ducas, B. P. Co., New York			Link-Belt Company, Chicago	667	
Bishop, J., & Co., Platinum Works, Malvern, Pa.	356		Feculose Co., Ayer, Mass.			Mine & Smelter Supply Co., New York	704-705	
Pennsylvania Salt Mfg. Co., Philadelphia	1169		Morningstar, Chas., & Co., New York			Wood, E. D., & Co., Philadelphia	1070-1071	
Ames Chem. Wks., Glen Falls, N. Y.			Natl. Gum & Mica Co., New York			SKYLIGHT GUARDS		
SILVER SALTS. See specific headings			Paper Makers Chem. Co., Easton, Pa.			Anchor Post Iron Works, New York	288-289	
SILVER SOLDER. See Solder, Silver			Seydel Mfg. Co., Jersey City			Metal Fabrics Co., New York	700-701	
SILVER TRISALYT			Springfield Chem. Prod. Co., Springfield, Mass.			SKYLIGHTS		
Rosessler & Hasslacher Chemical Co., New York	1178-1179		Sykes & Co., Walter F., New York			Robertson, H. H., Company, Pittsburgh	806-808	
SILVER WASTE BOUGHT			Vera Chem. Co., North Milwaukee, Wis.			SKYLIGHTS, "ROBERTSON PATENT"		
Ames Chem. Wks., Glen Falls, N. Y.			Western Paper Makers Chem. Co., Kalamazoo			Robertson, H. H., Company, Pittsburgh	806-808	
SILVERINE			SIZINGS FOR SILK			SLABS, CARBON AND ALLOY		
McMeekan, David, Mfg. Co., Brooklyn	1149		Apex Chemical Co., Inc., New York	1094		Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa.	548-549	
SIMONSON - MANTUIS SLUDGE ACID, RECOVERY PROCESS			Mummel & Robinson Corp., New York	1135		SLABS, CHEMICAL		
American Lead Burning Co., New York	271		Klipstein, A., & Co., New York	1143		Acid Proof Clay Products Co., Akron, O.	248	
Mantius Engineering Co., New York	688-689		Malt-Diastase Company, New York	1151		General Ceramics Company, New York	504-507	
SINGING MACHINES, GAS			McMeekan, David, Mfg. Co., Brooklyn	1149		Hood, E. Minin, Brick Co., Atlanta, Ga.	589	
Textile-Finishing Machinery Co., Providence	884		Philadelphia Quartz Co., Philadelphia	1171		Knight, Maurice A., East Akron, O.	638-649	
Curtis & Marble Mach. Co., Worcester, Mass.			Wolf, Jacques & Company, Passaic, N. J.	1212		SLABS, ROOF PRE-CAST		
Improved Appliance Co., Bklyn.			Arabol Mfg. Co., New York			Robertson, H. H., Company, Pittsburgh	806-808	
SINKS, LABORATORY			Beaver Chem. Co., Damascus, Va.			SLABBERS, SOAP		
Alberene Stone Co., New York	258-259		Bloede, V. G. Co., Baltimore			Houchin-Alken Co., Brooklyn	578-579	
Duriron Company, New York	450-453		Bosson & Lane, Atlantic, Mass.			SLACKERS, LIME		
General Ceramics Co., New York	504-507		Dewey & Almy Chem. Co., Cambridge, Mass.			Kilby Mfg. Co., Cleveland	636	
Knight, Maurice A., E. Akron, O.	638-649		Dextro Prod., Inc., Buffalo			SLAG, GRANULATED		
Peterson, Leonard & Company, Inc., Chicago	759		Ducas, B. P. Co., New York			American Mineral Products & Color Co., Nobels-town, Pa.	1091	
SINTERING PLANT EQUIPMENT			Fancourt, W. F., & Co., Phila.			SLAG TAPPING BLOCKS		
Bartlett, C. O., & Snow Co., Cleveland	338		Jack, Louis, Co., New York			Fuller-Lehigh Company, Fullerton, Pa.	492-493	
			Leyland, Thos., & Co., Boston			SLASHERS		
			Morningstar, Chas., & Co., New York			Textile Finishing Machinery Co., Providence	884	

The Symbol "Ⓢ" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

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Independent Salt Co., New York  
Inland Crystal Salt Co., Salt Lake City  
Internatl. Salt Co., New York  
Kanawha Salt & Chem. Div., Charlestown, W. Va.  
LeRoy Salt Co., LeRoy, N. Y.  
Mason Coal & Chem. Co., Hartford, W. Va.  
Mechling Bros. Mfg. Co., Camden, N. J.  
Morton Salt Co., Chicago  
Myles Salt Co., New Orleans, La.  
O. River Salt Co., Mason, W. Va.  
O. Salt Co., Wadsworth, O.  
Pittsburgh Plate Glass Co., Bartsch, O.  
Salt Lake Chem. Co., New York  
Squibb, E. R. & Sons, New York  
Stauffer Chem. Co., San Fran.  
Sterling Salt Co., Hallow, N. Y.

**SODIUM CHOLATE**

Digestive Ferments Co., Detroit

**SODIUM CHLORIDE, C. P. "BAKER'S ANALYZED"**

Baker, J. T., Chemical Co., Philadelphia, N. J. 1095

**SODIUM CHROMATE**

Mutual Chemical Co. of America, New York 1158  
Merck & Co., New York

**SODIUM CITRATE**

Albany Chemical Company, Albany, N. Y. 1087

Cooper, Chas., & Co., New York 1111

Klipstein, A., & Co., New York 1113

Phar, Chas., & Co., Inc., New York 1170

**SODIUM CITRATE, C. P. "BAKER'S ANALYZED"**

Baker, J. T., Chemical Co., Philadelphia, N. J. 1095

**SODIUM CYANIDE**

American Cyanamid Co., New York 1089

Chaplain & Bibbo, New York 1106

Cooper, Chas., & Co., New York 1111

Crothwaite, Ralph L., Co., New York 1112

Grasselli Chemical Co., Cleveland 1125

Klipstein, A., & Co., New York 1113

Lamson, John S. & Bro., New York 1116

Mathieson Alkali Works, New York 1152

Mine & Smelter Supply Co., New York 701-705

Powers - Weightman - Rosengarten Co., Philadelphia 1172

Roesler & Hasselacher Chemical Co., New York 1178-1179

Donner Fine Clay Co., Denver, Colo.

Flunkell, William T., New York

Guthrie, Chas. F., Co., New York

Griffiths, K. F. & Co., New York

Hampden Paint & Chem. Co., Boston

Hachmeister-Lind Chem. Co., Pittsburgh

Hardy, Chas., & Rupert, New York

Natl. Drug & Chem. Co., Montreal

Seldner & Enequist, Brooklyn

**SODIUM DIOXYTARTRATE**

Chaplain & Bibbo, New York 1106

**SODIUM FERROCYANIDE**

Klipstein, A., & Co., New York 1113

Roesler & Hasselacher Chemical Co., New York 1178-1179

Semet-Solvay Company, Syracuse 1182-1183

**SODIUM FERROCYANIDE**

Campbell, C. W., Chemicals, New York 1103

Chaplain & Bibbo, New York 1106

Herrick & Voigt, New York 1129

Klipstein, A., & Co., New York 1113

Lewis, John D., New York 1117

Mathieson Alkali Works, Inc., New York 1152

Miner Edgar Company, New York 1156

Niagara Alkali Co., Niagara Falls 1163

Pennsylvania Salt Manufacturing Co., Philadelphia 1169

Riker, J. L. & D. B., Inc., New York 1175

Roesler & Hasselacher Chemical Co., New York 1178-1179

Sergeant, E. M., Company, New York 1181

Smith Chemical & Color Co., New York 1190

Bower, Henry, Chem. Mfg. Co., Phila.

Citizen's Gas Co., Indianapolis

Griffiths, K. F. & Co., New York

Innis, Spelden & Co., New York

Nitrogen Co., Providence

Penman Littlehales Chem. Co., Syracuse

Portland Gas & Coke Co., Portland, Ore.

Seattle Lighting Co., Seattle, Wash.

Wilson Chem. Co., New York

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**SODIUM FERROCYANIDE, C. P. "BAKER'S ANALYZED"**

Baker, J. T., Chemical Co., Philadelphia, N. J. 1095

**SODIUM FERROCYANIDE PLANTS**

Bartlett Hayward Co., Baltimore 337

Hercules Engineering Corporation, New York 556-559

**SODIUM FLUORIDE**

Chaplain & Bibbo, New York 1106

Cooper, Chas., & Co., New York 1111

General Chemical Company, New York 1124

Grasselli Chemical Co., Cleveland 1125

Harshaw, Fuller & Goodwin Co., Cleveland 1127

Heyden Chemical Co., Garfield, N. J. 1131

Klipstein, A., & Co., New York 1113

Pennsylvania Salt Manufacturing Co., Philadelphia 1169

Spalden, E. R. & Sons, New York

Spaulding, E. R. & Sons, New York

Merck & Co., New York

Wardle, John C., & Co., Bklyn.

**SODIUM FLUOSILICATE. See Sodium Silicofluoride****SODIUM FORMATE**

Herrick & Voigt, New York 1129

Klipstein, A., & Co., New York 1113

Victor Chemical Works, Chicago 1207

Amer. Synth. Color Co., Stamford, Conn.

Greiff, R. W., & Co., Inc., New York

Reschbruch Chem. Corp., Syracuse

Trojan Powder Co., Allentown

**SODIUM GLYCOCHOLATE**

Digestive Ferments Co., Detroit

**SODIUM GLYCEROPHOSPHATE**

Klipstein, A., & Co., New York 1113

Merck & Co., New York

Monanto Chem. Wks., St. Louis

**SODIUM-GOLD CHLORIDE**

Powers - Weightman - Rosengarten Co., Philadelphia 1172

Amer. Chem. Wks., Glens Falls, N. Y.

Merck & Co., New York

**SODIUM HYDROSULFIDE**

Melrose Chem. Co., Melrose, Mass.

**SODIUM HYDROSULFITE**

Apex Chemical Co., Inc., New York 1094

Herrick & Voigt, New York 1129

Klipstein, A., & Co., New York 1113

Wolf, Jacques & Company, Passaic, N. J. 1212

Greiff, R. W., & Co., Inc., New York

Hub Divestuff & Chem. Co., Boston

Merrimac Chem. Co., Boston

**SODIUM HYDROXIDE, TECHNICAL (CAUSTIC SODA)**

Brown Company, Portland, Me. 1100

Butterworth-Judson Corp., New York 1102

Campbell, C. W., Chemicals, New York 1103

Chaplain & Bibbo, New York 1106

Cooper, Chas., & Co., New York 1111

Dow Chemical Company, Midland, Mich.

General Chemical Company, New York 1124

Grasselli Chemical Co., Cleveland 1125

Harshaw, Fuller & Goodwin Co., Cleveland 1127

Herrick & Voigt, New York 1129

Hill's, Edward, Son & Co., Inc., New York 1133

Hooker Electrochemical Co., New York 1134

International Oxygen Co., Newark, N. J. 597

Lamson, John S. & Bro., New York 1116

Klipstein, A., & Co., New York 1113

Lewis, John D., New York 1117

Mathieson Alkali Works, Inc., New York 1152

Miner Edgar Company, New York 1156

Niagara Alkali Co., Niagara Falls 1163

Pennsylvania Salt Manufacturing Co., Philadelphia 1169

Riker, J. L. & D. B., Inc., New York 1175

Roesler & Hasselacher Chemical Co., New York 1178-1179

Sergeant, E. M., Company, New York 1181

Solvay Process Company, Syracuse 1186-1189

Warner Chemical Company, New York 1209

Alexander, G. S., & Co., New York

Alta Electro-Chem., Ltd., Calgary, Alta.

Barad, A. S. & Co., Kansas City

Brunner, Mond, Ltd., Amherstburg, Ont.

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**SODIUM HYDROXIDE, TECHNICAL (CAUSTIC SODA)—Con.**

Burgess Sulfito Fiber Co., Berlin, N. Y.

Bush, Beach & Gent, New York

Can. Salt Co., Windsor, Ont.

Champion Chem. Wks., Chicago

Champion Fiber Co., Canton, N. C.

Diamond Alkali Co., Pittsburgh

Druck, U. R. W., & Sons Co., Cincinnati

Eagle Eye Wks., Milwaukee

Globe Chem. Co., Cincinnati

G. W. Electro Chemical Co., San Fran.

Hess, Spelden & Co., New York

Internatl. Metal Co., Los Angeles

Mendleson, A., Sons, Albany, N. Y.

Merchants Chem. Co., Milwaukee

Mich. Alkali Co., Detroit

Mich. Electrochem. Co., Menominee, Mich.

Niagara Smelt. Corp., Niagara Falls

Nichols Chem. Co., Montreal

Pittsburgh Plate Glass Co., Bartsch, O.

Repub. Chem. Co., Pittsburgh

Rordon Pulp & Paper Co., Montreal

Seldner & Enequist, Bklyn.

Seidel Mfg. Co., Jersey City

Spaulding, E. R. & Sons Co., Cambridge, Mass.

Vulcan Detinning Co., Searsville, N. J.

Wander, S. & Sons Chem. Co., Albany, N. Y.

Warner Klipstein Chem. Co., New York

Whittaker, Clark & Daniels, New York

Wardle, John C., & Co., Bklyn.

Wing & Evans, New York

Winkler, Isaac, & Bro., Co., Cincinnati

**SODIUM HYDROXIDE, C. P. "BAKER'S ANALYZED"**

Baker, J. T., Chemical Co., Philadelphia, N. J. 1095

**SODIUM HYPOCHLORITE. See also Bleach**

Hooker Electrochemical Company, New York 1134

Niagara Alkali Co., Niagara Falls 1163

Pennsylvania Salt Manufacturing Co., Philadelphia 1169

Warner Chemical Company, New York 1209

Chlorine Prod. Co., Chicago

**SODIUM HYPOCHLORITE PLANTS. See Cells, Electrolytic****SODIUM HYPOPHOSPHITE**

General Chemical Co., New York 1124

Merck & Co., New York

**SODIUM HYPOSULFITE**

Cooper, Chas., & Co., New York 1111

Daigger, A., & Co., Chicago 1228

General Chemical Co., New York 1124

Grasselli Chemical Co., Cleveland 1125

Harshaw Fuller & Goodwin Co., Cleveland 1127

Rhodis Chemical Company, New York 1174

Roesler & Hasselacher Chemical Co., New York 1178-1179

Chem. Economy Co., Los Angeles

Contact Process Co., Buffalo

Durac Chem. Corp., New York

Greiff, R. W., & Co., New York

Lennig, Chas., & Co., Phila.

Mann, A. R., Chem. Co., Los Angeles

Mechling Bros. Mfg. Co., Camden, N. J.

Naugatuck Chem. Co., Naugatuck, Conn.

Nichols Chem. Co., Montreal

Rockhill & Victor, New York

Roche & Haas Co., Phila.

Seldner & Enequist, Bklyn.

**SODIUM HYPOSULFITE, C. P. "BAKER'S ANALYZED"**

Baker, J. T., Chemical Co., Philadelphia, N. J. 1095

**SODIUM IODATE**

Elmer & Amend, New York 457

Will Corporation, Rochester 972-1066

**SODIUM IODIDE**

Albany Chemical Company, Albany, N. Y. 1087

Cooper, Chas., & Co., New York 1111

Heyden Chemical Co., Garfield, N. J. 1131

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Merck & Co., New York			Tennant, C. Sons & Co., New York			Warner Chemical Company, New York		1209
SODIUM IODIDE, C. P. "BAKER'S ANALYZED"			SODIUM NITRATE, C. P. CRYST. "BAKER'S ANALYZED"			SODIUM PHOSPHATE, DIBASIC, C. P.		
Baker, J. T., Chemical Co., Phillipsburg, N. J.		1095	Baker, J. T., Chemical Co., Phillipsburg, N. J.		1095	LaMotte Chemical Products Co., Baltimore		1144-1145
SODIUM MANGANATE			Will Corporation, Rochester		972-1066	Will Corporation, Rochester		972-1066
Kalbfleisch Corporation, New York		1142	SODIUM NUCLEINATE			SODIUM PHOSPHATE, MONOBASIC		
SODIUM (METAL)			Digestive Ferments Co., Detroit			Victor Chemical Works, Chicago		1207
Powers - Weightman-Rosengarten Co., Philadelphia		1172	SODIUM OXALATE			Warner Chemical Company, New York		1209
Roessler & Hasselacher Chemical Co., New York		1178-1179	Cooper, Chas., & Co., New York		1111	Merck & Co., New York		
Will Corporation, Rochester		972-1066	Crosthwaite, Ralph L., Co., New York		1112	Rockhill & Victor, New York		
Special Chem. Co., Highland Park, Ill.			Kummel & Robinson Corp., New York		1135	SODIUM PHOSPHATE, TRIBASIC		
SODIUM META-BISULFITE			Amer. Alkali & Acid Co., Bradford, Pa.			General Chemical Co., New York		1124
Hardewyck, H., New York			Dissoway Chem. Co., Bklyn.			Grasselli Chemical Co., Cleveland		1125
Maas, A. R., Chem. Co., Los Angeles			Roseburgh Chem. Corp., Syracuse			Harshaw Fuller & Goodwin Co., Cleveland		1127
Stearite Co., Yonkers, N. Y.			Squibb, E. R. & Sons, New York			Roessler & Hasselacher Chemical Co., New York		1178-1179
SODIUM METANILATE			Trojan Powder Co., Allentown, Pa.			Warner Chemical Company, New York		1209
Du Pont de Nemours, E. I., & Co., Wilmington		1116-1118	Wiarda, John C. & Co., Bklyn.			Amer. Agric. Chem. Co., New York		
Synthetical Laboratories of Chicago, Chicago		1191	SODIUM OXALATE, C. P. "BAKER'S ANALYZED"			Bowker Chem. Co., New York		
SODIUM NAPHTHIONATE			Baker, J. T., Chemical Co., Phillipsburg, N. J.		1095	Burns Mfg. Co., New York		
Du Pont de Nemours, E. I., & Co., Wilmington, Del.		1116-1118	SODIUM PENTASULFIDE			Merck & Co., New York		
Klipstein, A., & Co., New York		1143	Buchanan, C. G., Chem. Co., Cincinnati			Nichols Chem. Co., Montreal		
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dence			Barrett Company, New York	1096-1097		Merck & Co., New York		
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White, S. S., Dental Mfg. Co.,			Inc., New York	1125		Barrett Company, New York	1096-1097	
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Conn.			Forest Prod. Chem. Co., Memphis			apolis		
WIRE, TUNGSTEN			Hirsch & Schofield, New York			Sherwin-Williams Co., Cleveland		
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						New Haven Gas Light Co., New		
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Peoples Gas Light & Coke Co., Chicago	
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United Furnace Co., Canton, O.	
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<b>YARA-YARA</b>	
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Buchanan, C. G., Chem. Co., Cincinnati	
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Klipstein, A., & Co., New York	1143
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Buchanan, C. G., Chem. Co., Cincinnati	
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Cowan, John, Chem. Co., Montreal	
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N. J. Zinc Co., New York	
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Denver Fine Clay Co., Denver, Colo.	
Granby Min. & Smelt Co., St. Louis	
Hachmeister-Lind Chem. Co., Pittsburgh	
Ill. Zinc Co., Peru, Ill.	
Innis, Spelden & Co., New York	
Lanyon, Robt., Zinc & Acid Co., Hillsboro, Ill.	
Mich. Smelt & Ref. Co., Detroit	
Mineral Point Zinc Co., Chicago	
Nassau Smelt. & Ref. Wks., New York	
N. J. Zinc Co., New York	
Richards & Co., Boston	
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U. S. Smelt Co., New York	
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The Symbol "⊕" before firms not using space to describe their facilities indicates that the firm is not a manufacturer of the item mentioned. For Alphabetical List of Firms using catalog space see page 12

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ZINC METAL. See Spelter and Zinc		Schapper Chem. Co. Chicago		Mineral Ref. & Chem. Corps., St. Louis	
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Internatl. Metal Co., Los Angeles		Buchanan, C. G., Chem. Co., Cincinnati		Baker, J. T., Chemical Co., Phillipsburg, N. J.	1095
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Cooper, Chas., & Co., New York	1111	Strossen-Reuter & Biser, Chicago		Whittaker, Clark & Daniels, New York	
Dalger, A., & Co., Chicago	1128	ZINC STRATE		ZINC SULFITE	
Drakenfeld, B. F., & Co., Inc., New York	1115	Chris, Antoine, Co., New York	1108	N. J. Zinc Co., New York	
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Smith Chemical & Color Co., New York	1190	Grasselli Chemical Co., Cleveland	1125	Hercules Powder Co., Wilmington, N. J.	
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Amer. Zinc & Chem. Co., Pittsburgh		Metal & Chemicals Extraction Corp., San Francisco	1153	ZINC, BATTERY	
Amer. Zinc, Lead & Smelt Co., St. Louis		Powers - Weightman - Rosengarten Co., Philadelphia	1172	Grasselli Chemical Co., Cleveland	1125
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Christal Chas. B., New York		Amer. Metal Co., New York		ZIRCONIUM	
Greoff, R. W., & Co., New York		Amer. Smelt & Ref. Co., Salt Lake City		National Sales Co., Cincinnati	1161
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Merck & Co., New York		Cowan John, Chem. Co., Montreal		ZIRCONIUM-FERRO-SILICON	
Mineral Point Zinc Co., Chicago		Crown Chem. Co., Pittsburgh		Foote Mineral Co., Phila.	
N. J. Zinc Co., New York		Donnelly Chem. Co., Newark, N. J.		ZIRCONIUM HYDRATE	
Soldner & Enequist, Bklyn		Gl. Amer. Chem. Prod. Co., New York		Welsbach Company, Gloucester, N. J.	1210
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Philch, Paul & Co., New York		Innis, Spelden & Co., New York		Foote Mineral Co., Phila.	
Whittaker, Clark & Daniels, New York				ZIRCONIUM NITRATE	
ZINC OXIDE, C. P. "BAKER'S ANALYZED"				Welsbach Company, Gloucester, N. J.	1210
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				"ZIRKITE" BRICK AND CEMENT	
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Our equipment is distinguished by this well known black and white mark.

**PAUL O. ABBÉ**

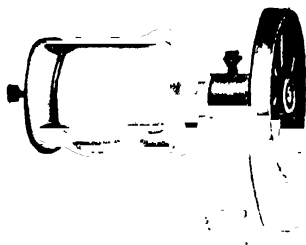
### JAR MILLS

The Jars are made from the very highest grade of Porcelain and will last for years. They are substantially fastened, none of them being held in position by rubber bands.



DOUBLE SPECIMEN MILL. PRICE, \$36.50

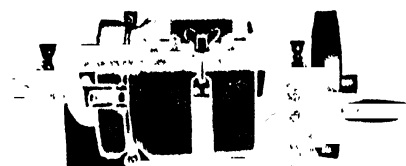
Mills built with either 1, 2 or 5 Jars.  
Specimen Jar measures, outside 5.2 x 5.71 inches.  
Capacity,  $\frac{1}{4}$  oz. to 1  $\frac{1}{2}$  lbs. at a charge, dry. (Sand as unit)  
Capacity,  $\frac{1}{4}$  gallon, wet.



SINGLE BACILLI MILL. PRICE, \$28.50

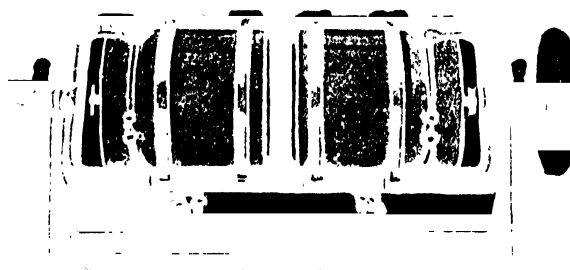
Mills built with 1, 2 or 5 Jars.  
The Bacilli Jar is of special form inside, so it can be used for Tubercle Bacilli, etc.

Bacilli Jar measures, outside, 5.75 x 6.5 inches.  
Capacity,  $\frac{1}{4}$  oz. to 2 lbs. at a charge. (Sand as unit).  
Capacity,  $\frac{1}{8}$  gallon, wet.

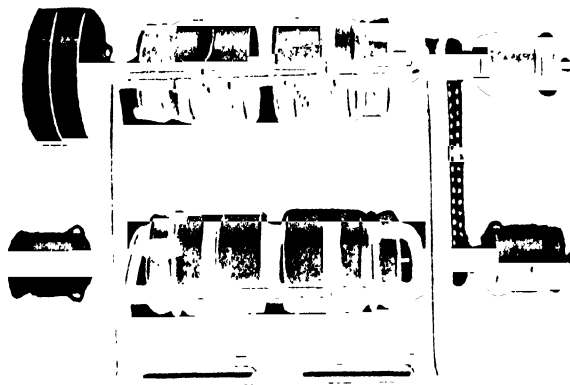


TYPE "A" SINGLE ASSAY MILL. PRICE, \$65.00

Mills built with either 1, 2, 3, 4, 6, 8, 9 or 12 Jars.  
Assay Jar measures, outside, 8.75 x 9.65 inches.  
Capacity, 1 oz. to 5 lbs. at a charge, dry. (Sand as unit).  
Capacity, 1 gallon, wet.



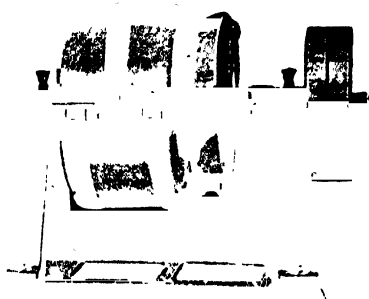
TYPE "A" DOUBLE ASSAY MILL. PRICE, \$82.50



TYPE "D" QUADRUPE ASSAY MILL WITH SPECIMEN JARS (3). PRICE, \$180.00

The above illustration shows one of many different mills combining several sizes of jars.

*Continued on Next Page*



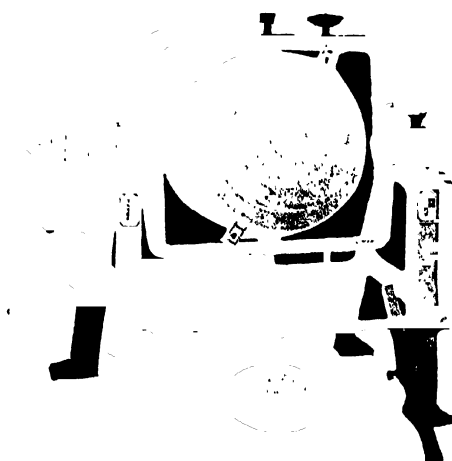
SINGLE NO. 0 JAR MILL. PRICE, \$82.50

Mills built with 1, 2 or 4 Jars  
No. 0 Jar measures, outside, 12.5 x 9.6 inches  
Capacity, 1/4 to 10 lbs at a charge. (Sand as unit.)  
Capacity, 2 gallons, wet.



SINGLE NO. 1 JAR MILL. PRICE, \$107.50

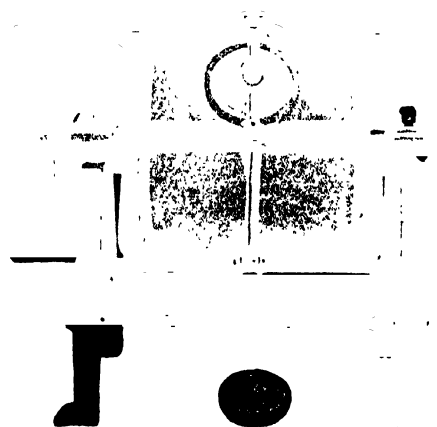
Mills built with either 1, 2 or 4 Jars  
No. 1 Jar measures, outside, 13 x 12.5 inches  
Capacity, 1 to 15 lbs at a charge (Sand as unit)  
Capacity, 4 gallons, wet.



NO. 2 JAR MILL, OPEN. PRICE, \$192.50

No. 2 Jar measures, outside, 14.75 x 16.5"  
Capacity, 5 to 25 lbs. at a charge. (Sand as unit.)  
Capacity, 6.6 gallons, wet.

The illustration below shows the type of construction used in building No. 3, No. 4 and No. 5 Jar Mills.



NO. 3 JAR MILL. PRICE, \$220.00  
No. 4 " " " 250.00  
No. 5 " " " 305.00

No. 3 Jar measures, outside, 17.72 x 10"  
Capacity, 10 to 30 lbs at a charge (Sand as unit.)  
Capacity, 7.66 gallons, wet  
No. 4 Jar measures, outside, 17.72 x 18.70"  
Capacity, 20 to 60 lbs at a charge (Sand as unit.)  
Capacity, 15.59 gallons, wet  
No. 5 Jar measures, outside, 22.5 x 19"  
Capacity, 25 to 80 lbs at a charge. (Sand as unit.)  
Capacity, 23.78 gallons, wet

### PAUL O. ABBÉ JARS

Paul O. Abbé Jars are of Standard form, as used for many years, and will be supplied with Neckbands, Crossbars, Gaskets, Pebbles, etc., from stock.

In some supply catalogs these are listed as Ball Mills.



### JAR SIZES

5.2	5.75	8.75	12.5	13.0	14.75
x	x	x	x	x	x
5.71	6.5	9.65	9.6	12.5	16.5
in.	in.	in.	in.	in.	in.

### PORCELAIN BALLS, METAL BALLS OR SLUGS

Porcelain Balls, Metal Balls or Slugs will be furnished with our Jar and Pebble Mills to meet special conditions when wanted, instead of the Hand Selected Flint Pebbles, but at extra cost.

### CATALOGS

We issue 5 catalogs:

"A"—Ball or Pebble Mills.

"B"—Crushers, Cutters, Grinders, Sifters, etc.

"C"—Mixers and Sifters.

"D"—Jar Mills.

"E"—Mead Mills.

Also Booklets regarding Dufour Bolting Cloth.

*Continued on Next Page*

## PEBBLE MILLS

Designed mechanically correct, substantially built of first-class materials throughout. These machines, as well as the Jar Mills, grind and mix dry or wet.

These Mills have no contaminating surfaces, create no dust in the working room, cause no loss of material, and reduce all of the product. Produce a uniform finished material, run for years without repairs, are always adjusted and require no dressing, need no attention while operating. Save in power, labor, space and time, no skilled labor required.



NO. 6 PEBBLE MILL. PRICE, \$390.00

Cylinder, 30" diameter x 33 1/2" long

## PEBBLE MILLS—LIST OF SIZES, ETC.

	No. of Mill	Diameter of C <sub>1</sub> linder	Length of C <sub>2</sub> linder	Capacity each charge taking about as unit holds in gallons inside of lining		Floor space required	Height	Size of Pulleys	Diameter of Gear Wheel	Amount of Pebbles supplied	H. P.		Shipping Weight	Speed of Cylinder R.P.M.
				Lbs.	Lbs.						Dry	Wet		
0		6"	8"	4000	1207	15" x 10"	9' 6"	36"x12"	6' 8"	8,300	20	15	26,000	13-18
1B	1A	6"	7"	3600	1114	14" x 10"	9' 6"	36"x12"	6' 8"	7,200	17	13	24,000	13-18
1		6"	6"	3200	931	13" 1/2" x 10"	9' 6"	36"x10"	6' 8"	6,100	15	11	22,000	13-18
2A		5'	5'	2800	748	13" x 10"	9' 6"	30"x10"	6' 8"	5,000	13	10	20,000	13-18
2		5'	4'	2200	632	12" 6" x 7"	9'	28"x10"	5' 3"	4,070	10	7	17,500	18-25
3C		4' 6"	5'	1500	390	10" 6" x 7"	9'	28"x8"	5' 3"	2,750	8	6	14,750	18-25
3B		4' 6"	4'	1550	408	10" 6" x 6"	7'	24"x8"	5'	2,800	8	6	15,000	25-30
3A		4' 6"	4'	1150	360	10" x 6"	7'	24"x8"	5'	2,500	7	5	12,700	25-30
3		4' 6"	4'	950	310	9' 6" x 6"	7'	24"x8"	5'	2,320	6	4	10,500	25-30
4		3' 9"	3'	800	262	9" x 6"	7'	24"x6"	5'	2,100	5	3 1/2	8,200	25-30
4		3' 9"	3'	500	160	7' 6" x 6"	6' 4"	15"x6"	5'	1,190	4	3	5,500	28-35
5A		3"	4"	350	125	7' 3" x 4' 3"	6"	36"x6"	5"	880	2 1/2	2	4,900	35-40
5		3"	3"	300	100	6' 9" x 4' 3"	6"	36"x6"	5"	770	2	1 1/2	4,200	35-40
6		2' 6"	2' 9 1/2"	200	60	5' 6" x 3' 9"	4' 9"	24"x4"	4"	440	1 1/2	1	2,200	38-44
7		2' 6"	1' 10 1/2"	120	36	4' 9" x 3' 9"	4' 9"	24"x4"	4"	330	1	3/4	1,900	38-44
8		1' 6"	2" 3"	50	16	3' 9" x 2' 3"	3"	18"x2"	2"	125	3/4	3/4	900	40-50
9		1' 3"	1' 7"	23	7	3' 2" x 2' 3"	3' 6"	16"x2"	2"	60	3/4	3/4	700	50-55

## PEBBLE MILLS (Continued)



NO. 3 PEBBLE MILL. PRICE, \$1210.00

Cylinder, 51" diameter x 42" long

## USES FOR JAR AND PEBBLE MILLS

Acetanilid	Fuller's Earth
Acid	Glazes
Aspirin	Guayule
Bacilli	Guncotton
Barytes	Iron Turnings
Bauxite	Lacquer (Metal and Wood)
Bone	Lactated Food
Calcined Lithia Crystals	Lime
Carbon	Magnesium Oxide
Carborundum	Marble
Carmin	Menthol
Cement	Milk Powder
Charcoal	Ores, etc.
Chemicals	Paints
Citric Acid	Pepsin
Coal	Plumbago
Coke	Pumice Stone
Colors	Pyrites
Colors in Alcohol	Quartz
Colors in Oil	Rotten Stone
Copper Paint	Rubber
Corundum	Shellac
Drugs	Silica
Emery	Slate
Enamels	Soapstone
Face Powders	Sugar of Milk
Feldspar	Talc
Fibrous Materials	Tobacco
Flint	Tungsten
Fret	Zinc Blend

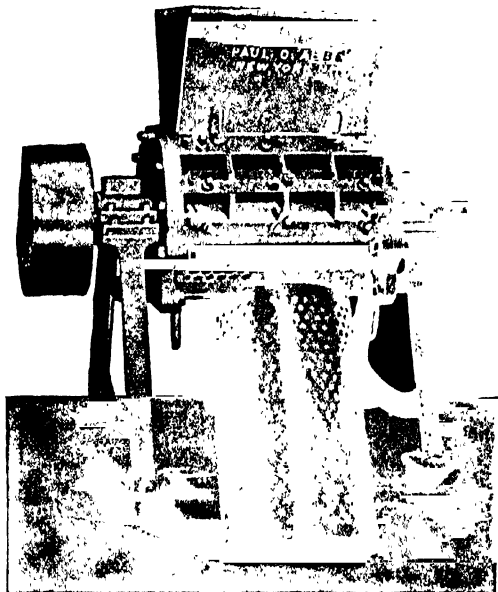
And a great variety of other materials too numerous to mention.

Paul O. Abbé Mills are the results of more than twenty-five years' actual experience in designing and building machinery operating on hundreds of different materials.

*Continued on Next Page*

**IMPROVED ROTARY CUTTER**

This machine has been on the market for 20 years, over 850 of them being in successful operation. It is built under United States patents, covering all the latest improvements.

**NO. 1 ROTARY CUTTER (CLOSED)**

Three screens furnished with each machine. Illustration shows one of the extra two.

**USES FOR IMPROVED ROTARY CUTTER**

The Improved Rotary Cutter is well adapted to the reduction of such materials as:

Asbestos	Guayule Shrub	Rechipper in Sulphite
Asbestos Scrap	Hard Fiber	Mill
Barks	Hard Rubber	Roots
Boiler Covering	Herbs	Rubber
Bones	Leather	Sawdust
Bread	Leaves	Shavings
Cardboard	Magazines	Spices
Celluloid	Mustard	Spruce Wood Chips
Chick Food	Newspapers	Spills
Chicory	Oat Hulls	Tobacco Stems
Chipped Log Wood	Paper	Trading Stamps, Cou-
Cork	Paper Cones	pons and Books
Drugs	Pulp	Vegetable Ivory
Grains of all kinds	Rags	Wood Blocks, etc.

The machine is so built that it will cut either the most delicate leaves or the hardest roots, such as:

Chinese Licorice      Turmeric      Soap Root  
Nux Vomica, etc.

This machine is used in Boiler Covering Works, Bone and Tallow Plants, Chemical Works, Cork Works, Drug Mills, Feed and Flour Mills, Fertilizer Plants, Grease and Soap Plants, Paper Mills, Rubber Regenerating Works, Spice Mills, Sulphite Mills, etc.

**LIST OF SIZES, ETC.**

No. of Machine	Floor Space Required	Shipping Weight, Lbs.	Size of Pulley	Speed R. P. M.	H. P. Required	Size of Screen
No. 0	3'1" x 1' 5"	500	10 x 3"	900 to 1200	2 to 5	10 x 17"
No. 1	4'0" x 2'10"	1500	16 x 6"	600 to 900	5 to 15	30 x 34"
No. 1½	5'8" x 2' 6"	2150	18 x 8"	600 to 900	10 to 20	25½ x 24½"
No. 2	5'8" x 3' 6"	4000	20 x 6"	600 to 900	15 to 40	20½ x 27½"
No. 2½	8' x 3' 3"	6000	20 x 8"	500 to 800	20 to 45	36½ x 35½"
No. 3	8'6" x 3' 7"	12000	30 x 12"	500 to 750	30 to 60	50½ x 29½"

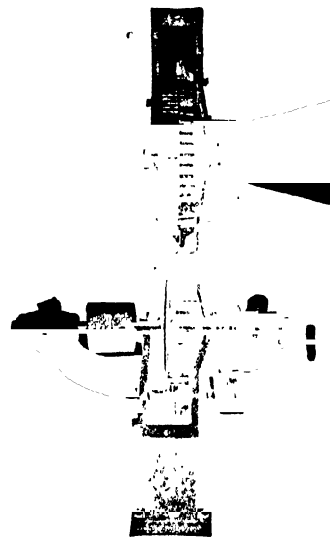
**MEAD MILL**

This mill is so well known and so universally used that mere mention of the fact that we are Sole Eastern Agents for this machine will suffice for the vast majority of the trade.

To those as yet unfamiliar with this type of machine, we would say that this is the drug mill of greatest general use, doing coarse and fine grinding as desired, and is especially the mill for granulation and percolation.

**NO. 1 MILL**

Handles such material as roots, barks, leaves, flowers, gums, resins, aloes, asphaltum, casein, chicle, cocoa, dried milk, rosin, shellac and sulphur, generally reducing or dividing them to from 30 to 100 Mesh fine.

**OPENED TO SHOW DISC, SCREEN, BLANK AND CORRUGATED RINGS**

This is the Mill for glue and gelatin, dry precipitates, chemical salts, phonograph discs, battery boxes, leather scraps and hundreds of other materials.

Capacity depends entirely upon the nature of the material to be ground, and our service is always at your disposal.

**TABULAR INFORMATION ON MEAD MILLS**

No. of Mill	H. P. Required	Speed R. P. M.	Size of Pulley	Weight
Pony	1	5000	8 x 2½"	150
1	5 to 6	3400	5 x 4½"	400
2	7½ to 9	2800	6 x 5½"	800
3	10 to 15	2300	8 x 7½"	1200

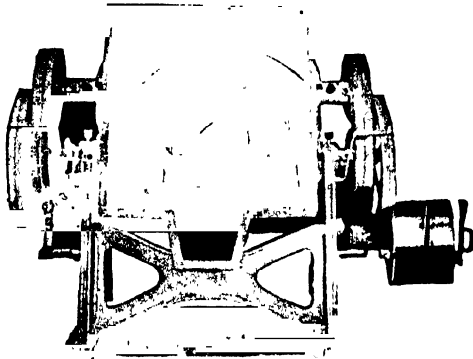
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**HEAVY MASS KNEADER**

Strong machines for heavy work such as Nitrocellulose Putty, Rubber, White Lead, etc.

Built with or without steam jacket.

Made in Six Sizes.



MASTODON MIXER

**DISC GRINDER WITH BREAKER**

The simplest and least expensive of all mills. Has one toothed or grooved disc revolving against a stationary disc. Made in several sizes.



DISC GRINDER

**AUTOMATIC RUBBER RESPIRATORS**

Automatic Rubber Respirator has a perfect filter device, and no sticking Valve Disc as is found in other respirators. It has large capacity and will keep out Dust, Smoke, Fumes and Gases and protects the exposed workman in any occupation. It is made of

Soft White Rubber, is easily kept clean, and bends perfectly to fit any face. Many thousands are in use and old customers are continually ordering more. Price \$24.00 per doz. On receipt of \$2.25 one will be forwarded as a sample. Money refunded if not as represented.

**BOLTING CLOTH**

We constantly carry a large stock of this material. Usually shipped in six hours.

Cloths made up promptly and in the most perfect and workmanlike manner. Usual delivery one day after order.

Webbing furnished in place of ticking, if desired.

**PRICE LIST FOR THE GENUINE****DUFOUR BOLTING CLOTH**

Price per yard, 10 inches wide

Mesher per lineal inch	Number	Standard	Extra heavy A	Double Extra XX	Mesher per lineal inch	Number	Extra XXX	Grit Gauze	XXX Grit Gauze
18	0000	\$2.45		\$2.95	71	0		No. 16 0000	No. 14 16
23	000	2.55		3.00	74	7	\$4.35	18	16 18
29	00	2.60		3.10	82	8	4.55	20,000	18 20
38	0	2.65		3.20	86	9	5.05	22	20 22
48	1	2.75		3.30	109	10	5.35	24	22 24
54	2	2.85		3.45	116	11	5.65	26 00	24 26
58	3	3.00		3.60	129	12	6.10	28	26 28
62	4	3.10		3.80	139	13	6.50	30	28 30
66	5	3.20		3.95	150	14	6.90	32	30 32
74	6	3.40	\$3.75	4.10	157	15	7.50	34 0	32 34
82	7	3.55	3.90	4.30	163	16	8.50	36	34 36
86	8	3.90	4.25	4.55	169	17	9.50	38	36 38
97	9	4.20	4.60	4.85	178	18	11.40	40	38 40
109	10	4.60	4.90	5.15	200	25		44 1	42 44
116	11	4.85	5.20	5.40				46	44 46
125	12	5.20	5.50	5.90				48	46 48
129	13	5.40	5.80	6.30				50 2	48 50
139	14	5.70	6.10	6.70				52	50 52
150	15	6.10	6.75	7.15				54 3	52 54
157	16	6.75	7.30	8.00				56	54 56
163	17	7.50	8.00					58 4	56 58
166	18	9.00						60	58 60
169	19	10.15						62 5	60 62
173	20	11.20						64	62 64
178	21	12.00						66 6	64 66
200	25	14.00						68 70	66 70
								70 7	68 72
								72	70

Grit Gauze, all Nos. \$4.65  
XXX Grit Gauze, all Nos. \$5.75

Date of above list, August 1, 1921

**RUBBER GOGGLES**

Gas Tight Rubber Goggles are made of a single piece of Pure Rubber and are Waterproof and Sanitary. Many different sizes and shapes of lenses can be used which are replaceable in a moment and are held constrictively. Are fitted with mica lenses for firemen's use. Fit anybody. Airtight. Protect the eyes against smoke. Used in many of the largest chemical and metallurgical plants in America. Price per dozen, \$18.00. On receipt of \$1.50 will send sample, postpaid.



# JOHN F. ABERNETHY

Lead Burning

708-710 MYRTLE AVENUE, BROOKLYN, N. Y.

## PRODUCTS

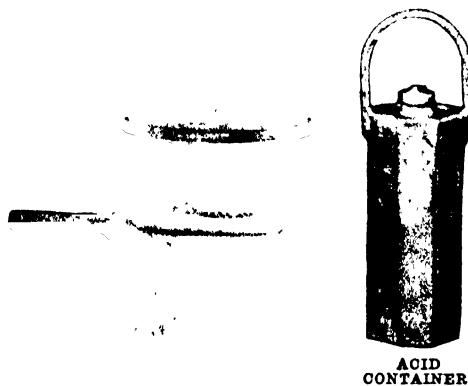
Lead Lined Tanks of all description; Lead Linings, for Tanks, Kettles, Vats, etc.; Agitators; Acid Chambers and Towers; Lead Sleeves; Lead Coils; Chemical Lead Traps; Acid Supply; Drain and Waste Lines. All kinds of Chemical Apparatus, made of lead, to order. Lead Lined Pipe and Fittings. Our Products cover practically everything in the chemical line, where lead is used. We make a specialty of Pure Tin Linings for vessels of every character.

## FACILITIES

We have recently moved from our old establishment to our new modernly equipped shops at the above address, where we will have ample facilities for production of the largest of lead chemical equipment.

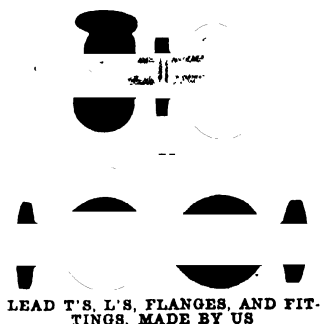
Lead burning in all its branches for chemical plants, etc., will be handled and executed in a thorough and competent manner, regardless of the size of the contract—large or small.

We have extensive business relations with many of the largest concerns and corporations in the United States.

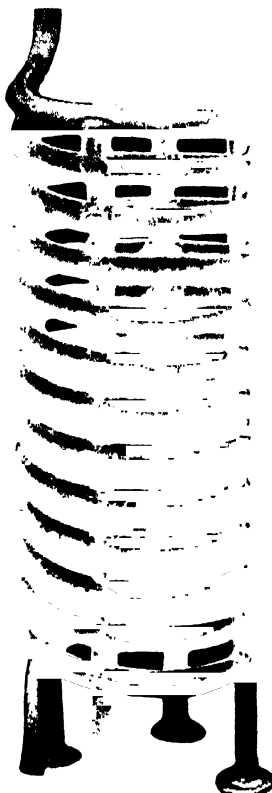
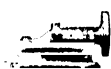


ACID  
CONTAINER

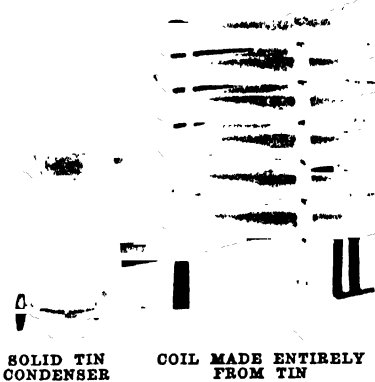
LEAD GAS TRAP



LEAD T'S, L'S, FLANGES, AND FIT-  
TINGS, MADE BY US

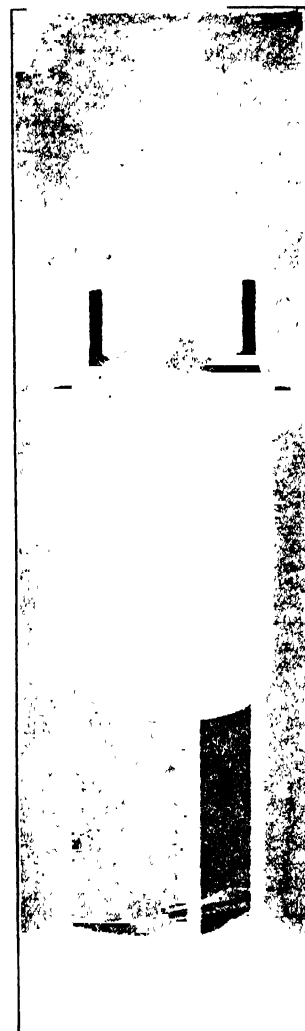


LEAD CONDENSING  
COIL



SOLID TIN  
CONDENSER

COIL MADE ENTIRELY  
FROM TIN



STILL MADE OF LEAD



LEAD ACID JUGS

# ACHESON GRAPHITE COMPANY

Manufacturers of

Acheson Electrodes and Acheson Anodes; Acheson Graphite Powders  
Miscellaneous Articles Machined from Pure Graphite Plates and Cylinders  
NIAGARA FALLS, N. Y.

## PRODUCTS

Acheson Electrodes  
Acheson Anodes  
Acheson Welding Electrodes  
Solid Resistance Units  
Contacts and Rheostat Discs  
Laboratory Utensils—Crucibles, Muffles, Tubes, etc.  
Graphite paint pigment  
Graphite for mechanical rubber goods  
Graphite for dry battery filler  
Graphite for foundry facing, packing, etc.  
Mold Wash  
Granular Resistor for resistance furnaces

## ACHESON ELECTRODES

Acheson Electrodes are manufactured in sizes suitable for operating any electric furnace, from the smallest laboratory furnace to the largest steel furnaces which require current densities over 20,000 amperes. Their use is not confined to steel alone, however, as they are used in every field of Electro-thermic work.

To enumerate, Acheson Electrodes are used in Electric Steel Furnaces, Electric Furnaces for the production of ferro-alloys, carbides, abrasives, and for the electric smelting of various ores such as iron, zinc, and lead. They are exclusively used in all of the Electric Arc Brass Furnaces. There is no Electric Furnace in use which cannot be adapted easily and at a low cost to use Acheson Electrodes. Many of the present furnaces have adopted them as standard. Being of solid pure graphite they ensure the lowest electrode and power consumption and the greatest current efficiency. Carrying with ease the highest currents which are used in Electric Furnace work, they give the lowest possible operating costs with the best working conditions.

All Acheson Electrodes are furnished either with plain ends, or with **machined** connections for endwise joining. No paste or joint compound is used in making up the Acheson joint.

## ACHESON ANODES

On account of their great purity and workability Acheson Anodes are the most satisfactory anodes which are available for electrolytic work. They are over 99 per cent pure graphite. Acheson Anodes can be readily machined so that any shape or size within practical limits can be secured.

On account of the ease of machining small rods can be threaded into large posts or plates, giving a large working surface with a small leading-in rod at the same time keeping the anode in one solid unit. They are capable of easy impregnation so that anode life can be prolonged by the use of beneficial paraffine or oil when the process in question allows impregnation. Acheson Anodes are made in many stock sizes and can be shipped either all assembled ready for use, or machined to specifications for assembly at the place required. Their long life in use and comparative low cost make them the ideal anode for commercial use. Practically all of the producers of electrolytic chlorine and caustic use Acheson Anodes, and the manufacturers of chlorine cells have adopted them as standard equipment. Their use, however, is not confined to chlorine cells alone; they are also being very successfully used in chlorate work, in cyanide solutions, in the electrolysis of fused baths, in the electrolytic recovery of copper and in solutions where Fluorine, Bromine, and Iodine are liberated.

## ACHESON WELDING ELECTRODES

Acheson Welding Electrodes were developed for use in the carbon-arc welding machines. They are made in standard sizes to fit all machines and can be had either pointed or unpointed. Chief among the many advantages of Acheson Welding Electrodes is their high current carrying capacity. On account of this feature they do not heat up, so that the metal holders or clamps are never injured. Flaking or spalling off is eliminated and breakage is rarely encountered. This, of course, together with the low consumption of electrode-per-weld makes their life much greater than that of other welding electrodes, so that they mean not only greater convenience, but lower welding or cutting cost than when other welding electrodes are used.

Contacts, solid resistor units, and laboratory utensils are all cut from solid Acheson plates and cylinders. They possess the advantages of high electrical conductivity and great purity, all running over 99 per cent pure graphite. Especially in the case of the laboratory utensils such as crucibles, tubes, etc., the very high purity is of inestimable value.

Rheostat discs of any diameter or thickness are readily manufactured from Acheson Rods, and very fine gradations in resistance can be obtained by centering these discs on rods or in holders and applying varying pressures by the use of a cam.

Stirrers and skimmers for foundry work cut from Acheson Plates are very successful not only on account of their great purity but because of the much longer life they have in actual service.

## ACHESON GRAPHITE POWDERS

Over fifty different grades of powdered graphite ranging from by-product grades of low purity to grades over 99.9% pure, and in fineness from coarse resistors to impalpable powders, are manufactured from the highest quality raw materials obtainable.

On account of space limitations it would be impossible to give here a detailed description of each grade of Acheson Graphite manufactured. However, for convenience sake, we have listed some of our various grades, showing the particular grades of graphite which are ordinarily used in different fields. Complete analysis of each grade will be furnished upon request. This table is not a recommendation but simply a rough classification of the various grades.

Mail samples are gladly furnished, and complete satisfaction becomes more assured if we are told the purpose for which the graphite is desired. All such information is of course treated as strictly confidential.

### PAINT PIGMENT

A A 1 } for high grade paint  
A P 1 }  
600 } for ordinary graphite  
700 } paint

### MECHANICAL RUBBER GOODS

424

### DRY BATTERY FILLER

No. 6 Cells  
BB1 BID  
452 793  
615 697  
750 BA2  
Flashlight Cells  
2301 842  
1840 615

### FOUNDRY FACING MANUFACTURE

TURE

F P C

600

### MOLD WASH

For Steel

600 } very high quality

AF1 }

For Non Ferrous Metals

AF1

### RESISTORS

Laboratory Resistors

BB4

BB5

Commercial Resistors

No. 9, 1/4"-1/2" mesh

No. 12, 1"-4" mesh

BB6

# THE ACID PROOF CLAY PRODUCTS CO.

GENERAL OFFICES

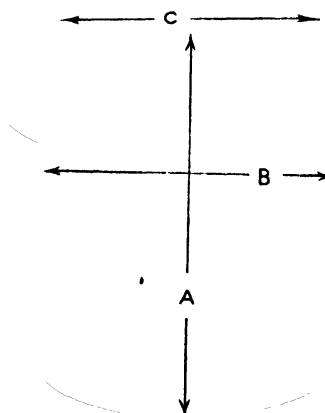
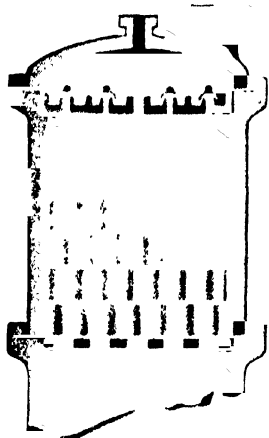
101 Flat-Iron Building  
AKRON, OHIO

## PRODUCTS

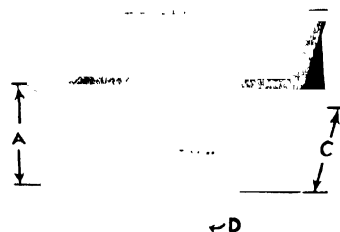
"Vitric" Acid Proof Chemical Stoneware Tower Equipment, Flanged or Socket Pipe and Fittings, Return Bends, Damper Pipe, Coils and Cooling Systems,

Receivers, Generators, Acid Lifts, Suction Filters, Storage and Straight Side Pots, Boiling Kettles, Stirring Outfits, Acid Eggs, Evaporating Dishes, Acid Tanks, Laboratory Sinks and Supplies, Check Valves, Faucets of all descriptions, Wire Mill Spool Pipe, Acid Plants (Arsenic, Nitric, etc.). Special designs to blue print for your individual needs.

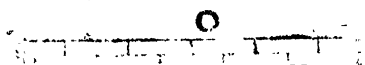
Buy "VITRIC," the best, ACID PROOF THROUGH AND THROUGH.



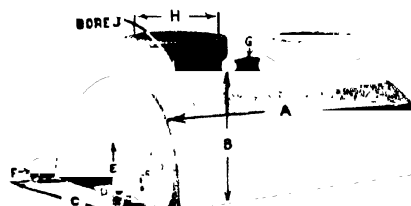
STRAIGHT SIDE POT



LABORATORY SINK



ACID RECOVERY TOWER EQUIPMENT  
All sizes



CELLARIUS TOURILL



# ACME COPPERSMITHING COMPANY, INC.

1009-11 W. Ohio Street  
CHICAGO, ILLINOIS

## PRODUCTS

Chemical Equipment of all Kinds constructed of Aluminum, Block Tin, Brass, Bronze, Copper, Lead, Monel Metal, Sheet Iron, Zinc.

### Autoclaves

### Bends

### Coils

Cooling

Heating

Reducing

### Condensers

### Defactors

### Digesters

### Drums

Scouring Machine

### Evaporators

### Expansion

Joints

Bends

### Extractors

### Kettles

Cooking

Confectioners

Dye

Heating

Jacketed

Varnish

and trucks

### Dyers' Equipment

Dippers

Kettles

Tanks

Vats

### Pans

Crystallizing

Jacketed

Revolving

Vacuum

### Receivers

### Still

Alcohol

Fractionating

Pressure

Vacuum

### Tanks

Heating

Storage

### Vats

## FACILITIES

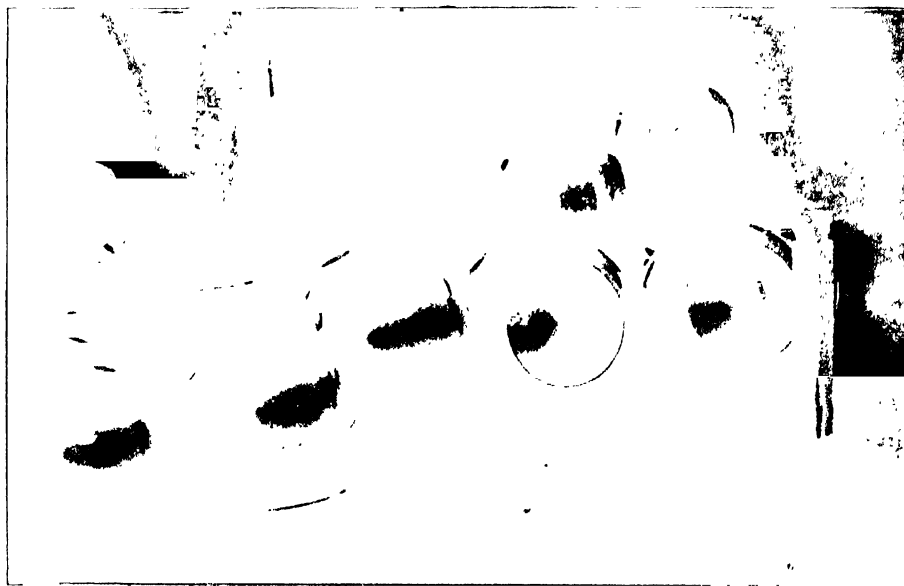
Our plant is equipped with the latest improved machinery and tools necessary for the construction of standard and special apparatus from aluminum, block tin, brass, bronze, copper, lead, monel metal, sheet iron, zinc or any of the metals that are practical in the sheet form.

One important point we wish to emphasize is the fact that we give all work the strictest supervision and inspection. This care assures you a high grade of workmanship. To further assure quality, we employ none but the best men to be obtained in the trade.

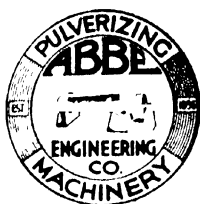
In addition to our own plant the company has favorable connections with reliable foundries and machine-shops to take care of necessary casting and machine work incidental to every piece of equipment. These connections also provide elasticity in that our capacity is thereby made unlimited.

## REFERENCES

We will furnish on request the names of several satisfied users of our equipment.



PART OF A SHIPMENT OF 81 REVOLVING PANS AND JACKETED KETTLES



## ABBÉ ENGINEERING CO.

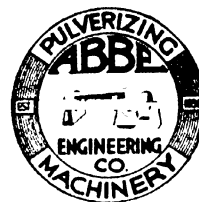
Designers of Pulverizing and Grinding Machinery

GENERAL OFFICES

Hudson Terminal Building

50F CHURCH STREET, NEW YORK, N. Y.

Telephones CORTLANDT 54 55 56



### PRODUCTS

Ball Mills; Eureka Mills; Jar Mills; Laboratory Mills; Max Mills; Pebble Mills; Sample Mills; Tube Mills; Bolting Cloth; Crushers; Filter Presses; Rotary Cutters.

See announcement of Beach-Russ Co., for Pressure Blowers, Acid and Vacuum Pumps, also Liquid Pumps.

Our machines awarded the Gold Medal at the Panama-Pacific Exposition.

### INQUIRIES

When making inquiries it will greatly facilitate matters if our correspondents will advise us regarding the following points:

1. What material is to be reduced.
2. How coarse it will be fed to the machine.
3. How fine (what mesh) the finished product is to be.
4. Capacity desired per hour.
5. Whether it is to be ground wet or dry.
6. If motor drive is desired advise characteristics of electric current available.

### TESTING LABORATORY

We maintain a completely equipped testing laboratory with a large number of machines set up ready for use, and prospective purchasers desiring to make a test on their material in our machines are invited to send samples, and we will gladly make a test, the result of which together with our **thirty-nine years'** experience will enable us to recommend the proper machine for the purpose. Tests will be made free of charge, but samples must be sent to us charges prepaid. Write for shipping instructions.

### LABORATORY MILLS

In presenting our Sample Mills, Laboratory Mills, Jar Mills "A" and "B," and Eureka Mills, we desire to call special attention to the fact that the porcelain jars of these machines are manufactured from the finest raw materials obtainable, made in the plastic state, thus forming jars that are impervious to the action of even such a material as ink.

In addition to the machines illustrated herewith, we also build mills having 3, 4, 6, 8, and 12 jars. The advantage of building the machines with jars in batteries is that a different material can be ground or mixed in each jar at one operation. We have given particular attention to the design of these machines so that they are easily taken out and replaced.

Our laboratory mills are particularly adapted for the grinding of small quantities of materials, being used by the various departments of the United States

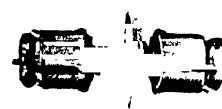
Government Assay and Testing Laboratories, Chemical and Dyestuff Laboratories, etc.

We can furnish any of our mills with motor drive, and when inquiring for price, it is necessary to have the characteristics of the electric current available so that the proper motor can be furnished.

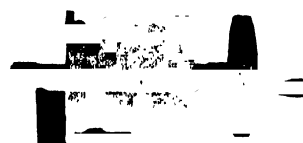
A partial list of materials that can be ground in these jars is given on page 253 under the list of materials that can be ground in Abbé Pebble Mills.



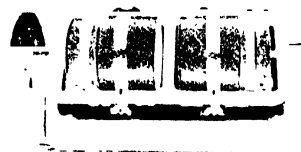
**SAMPLE MILL**  
Abbé Engineering Co.



**DOUBLE SAMPLE MILL**  
Abbé Engineering Co.  
Can also be supplied with five jars



**LITTLE TROJAN MILL**  
Abbé Engineering Co.



**DOUBLE TROJAN MILL**  
Abbé Engineering Co.

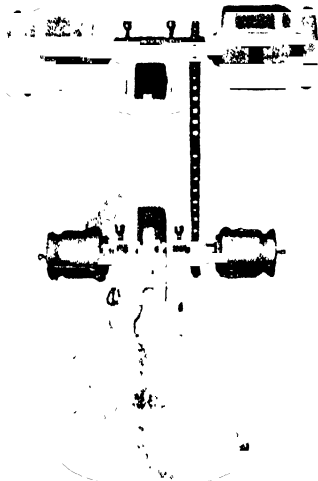
Either of above can also be equipped with one or two sample jars attached

### CAPACITY AND SIZE OF ABBÉ ONE-PIECE PORCELAIN JARS

Size	Outside Diam	Height	Capacity		
			Chg based on Sand	Total Volume in Gals	in Liters
Sample Laboratory or Trojan	5.2 in.	5.71 in.	1 1/2 lbs	0.283	1.08
Jar "A"	8.75 in.	9.65 in.	5 lbs	1.847	5.22
Jar "B"	13 in.	12.5 in.	15 lbs	4.0	15.20
Jar "C"	14.75 in.	16.5 in.	25 lbs	6.6	25.08
No. 1 Eureka	11 1/4 in.	13 1/2 in.	15 lbs	4.0	15.02
No. 2 Eureka	17.72 in.	10 in.	30 lbs	7.66	29.11
No. 3 Eureka	17.72 in.	18.7 in.	60 lbs	15.6	59.28
	22.5 in.	19 in.	80 lbs	23.8	90.44

Continued on Next Page

### COMBINATION LABORATORY MILL



**COMBINATION LABORATORY MILL**  
Abbé Engineering Co.

On account of the large demand for a machine which would be compact, simple and easy of access, we have designed our Combination Laboratory Mill. It can be arranged for direct motor drive if desired; thus it can be installed in the most convenient part of the laboratory, regardless of line shafts, pulleys, etc. We manufacture this mill in a very large number of different combinations, having 2 — 4—6 or 12 jars.

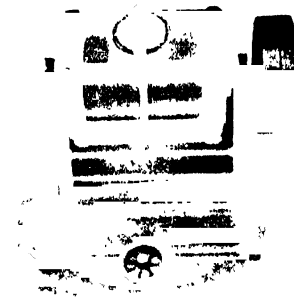
The jars adapted for this machine are:  
Sample Jar, up to 1½ lbs. Jar "A," up to 15 lbs.  
Laboratory Jar, up to 5 lbs. Jar "B," up to 25 lbs.



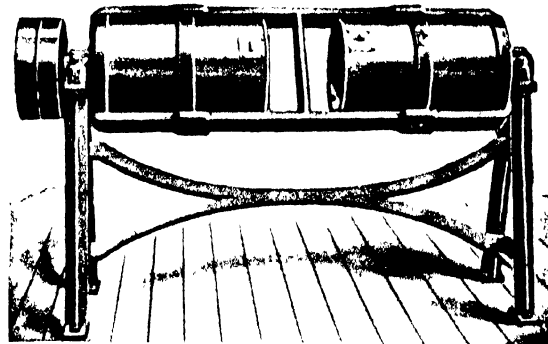
**12 JAR LABORATORY MILL**  
Also made with 4, 6 and 18 jars  
Abbé Engineering Co.



**JAR MILL "B"**  
We also make a double mill with two jars  
Abbé Engineering Co.



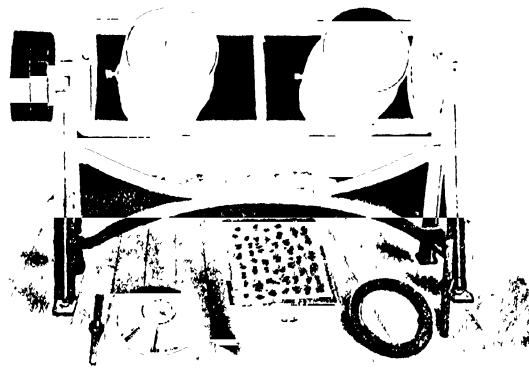
**EUREKA MILL, BUILT IN 3 SIZES**  
Abbé Engineering Co.



**DOUBLE JAR MILL "O" (Closed)**  
Also made with single jar  
Abbé Engineering Co.

This machine is particularly adapted for the grinding and testing of paper pulp, having been standardized for this work, although it is also suitable for the same kind of work as our other Jar Mills.

The Jar is protected by a steel casing and so arranged that it does not have to be lifted out when emptying a finished charge.



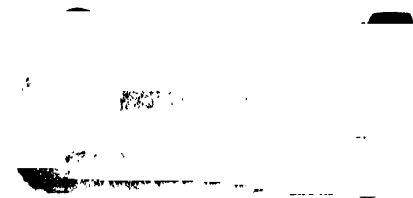
**DOUBLE JAR MILL "C" (Open)**  
Abbé Engineering Co.

### TABLE OF SIZES AND CAPACITIES

See table on page 250 for sizes and capacities of Jars.

*Continued on Next Page*

## ABBÉ TUBE MILL (PATENTED)



ABBÉ TUBE MILL—TRUNNION STYLE (Patented)  
Abbé Engineering Co.

We manufacture Tube Mills in both the Trunnion and Tire types, the Tire type requiring from 25% to 30% less power to drive them than the Trunnion. All of our Tube Mills are equipped with our **Patented Ideal Spiral Feed and Discharge** which enables the loading of the mill above the center, and increases the capacity, at the same time decreases the power required.



ABBÉ TUBE MILL—TIRE STYLE (Patented)  
Abbé Engineering Co.

PRICE LIST FOR THE GENUINE DUFOUR SWISS SILK  
BOLTING CLOTH

Price Per Yard, 40 Inches Wide

Mesha per lineal inch	Num ber	Stand ard	Extra heavy X	Double Extra XX	Mesha per lineal inch	Num ber	Treble Extra XXX	Grit Gauze	XXX Grit Gauze
18	0000	\$2.45		\$2.95				No.	No.
23	000	2.55		3.00				Equals	Equals
29	00	2.60		3.10				16-0000	14-16
38	0	2.65		3.20				18	16-18
48	1	2.75		3.30				20-000	18-20
54	2	2.85		3.45				22	20-22
58	3	3.00		3.60				24	22-24
62	4	3.10		3.80				26-00	24-26
66	5	3.20		3.95				28	26-28
74	6	3.40	\$3.75	4.10	71	6	\$4.35	30	28-30
82	7	3.55	3.90	4.30	74	7	4.55	32	30-34
86	8	3.90	4.25	4.55	82	8	4.80	34-0	32-36
97	9	4.20	4.60	4.85	86	9	5.05	36	34-38
109	10	4.60	4.90	5.15	97	10	5.35	38	36-40
116	11	4.85	5.20	5.40	109	11	5.65	40	38-42
125	12	5.20	5.50	5.90	116	12	6.10	42	40-44
129	13	5.40	5.80	6.30	125	13	6.50	44-1	42-46
139	14	5.70	6.10	6.70	129	14	6.90	46	44-48
150	15	6.10	6.75	7.15	139	15	7.50	48	46-50
157	16	6.75	7.30	8.00	150	16	8.50	50-2	48-52
163	17	7.50	8.00		157	17	9.50	52	50-54
166	18	9.00			163	18	11.40	54-3	52-56
169	19	10.15						56	54-58
178	20	11.20						58-4	56-60
178	21	12.00						60	58-62
200	25	14.00						62-5	60-64
								64	62-66
								66-6	64-68
								68	66-70
								70-7	68-72
								72	70

244 x 200, \$12.00

275 x 100, \$13.00

Grit-Gauze, all Nos., \$4.65

XXX Grit Gauze, all Nos., \$5.75

Cloths made up promptly and in the most perfect manner to fit any reel sieve frame.

Webbing furnished in place of Ticking, if desired. Orders shipped the same day we receive them. We import this cloth direct from Switzerland.

## ABBÉ PEBBLE MILLS (PATENTED)

Particularly adapted for Pulverizing or Mixing, Dry or Wet.

These are of the batch or intermittent type, the cylinder being approximately half filled with either pebbles or porcelain balls, or metal balls. The material is put into the cylinder through a manhole opening or door, after which the tight cover is fastened securely which practically hermetically seals the mill. Then the cylinder is revolved for a given period of time (this time depending on the hardness of the material and the fineness to which it is to be ground), after which the tight cover is replaced by the grate discharge cover, and the cylinder revolved until the material is sifted through the openings in the grate, and the pebbles or balls are retained in the cylinder.

For dry grinding, it is usually customary to build a casing around the mill to prevent dusting while discharging.

In wet grinding, the same directions are followed except there is no casing required; also instead of replacing the tight cover with a grate cover, we provide a special cover with a valve for emptying the mill.

**Patented Manhole Frame**—(This feature can only be had with our machines)—The manhole frames of all our Pebble Mills are made with detachable flanges, so that they can be easily replaced with new pieces of flat sheet iron when the inside lining is worn out. These are the flanges that hold the lining in position and gradually wear down with the same. To users of these mills this improvement will readily appeal as an important factor, as it avoids the riveting in of new manhole frames when a machine is to be relined.

**Linings**—Our mills are lined with either best vitrified porcelain blocks, silix blocks, cast iron, steel, or wood.

## LITTLE JUMBO NO. 1 FEED MILL

This mill is attractive in appearance, durable and efficient.

Size of Pulley, 6 x 4.

Capacity, 10 to 30 bushels per hour.

Speed, 290 to 1,150 R.P.M.

Shaft, 1½ in. cold rolled.

Burr, 6 inches.

Weight, 90 pounds.

Height, 33 inches.

Made of steel and iron throughout, bearings are long and well babbitted. Mill is provided with safety springs to protect burrs from nails, nuts, etc. The screw for adjusting burrs admits of grinding grain to practically any degree of fineness desired for feed.

One set of fine burrs, also one set of coarse burrs, furnished with each machine.

Speed R P M	H P Required	Bu Ground Per Hour
550	1½	10
670	2½	15
800	3	20
920	3½	25
1150	5	30

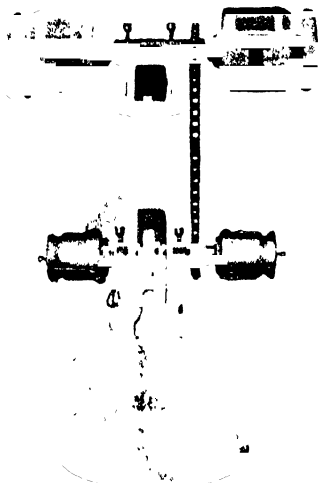
Price \$35.00 net F. O. B. New York.



LITTLE JUMBO  
NO. 1 FEED MILL

Continued on Next Page

### COMBINATION LABORATORY MILL



COMBINATION LABORATORY MILL  
Abbé Engineering Co.

On account of the large demand for a machine which would be compact, simple and easy of access, we have designed our Combination Laboratory Mill. It can be arranged for direct motor drive if desired; thus it can be installed in the most convenient part of the laboratory, regardless of line shafts, pulleys, etc. We manufacture this mill in a very large number of different combinations, having 2 — 4—6 or 12 jars.

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Sample Jar, up to 1½ lbs. Jar "A," up to 15 lbs.  
Laboratory Jar, up to 5 lbs. Jar "B," up to 25 lbs.



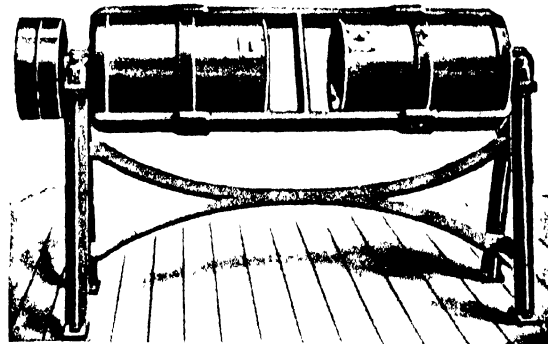
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Also made with 4, 6 and 18 jars  
Abbé Engineering Co.



JAR MILL "B"  
We also make a double mill with two jars  
Abbé Engineering Co.



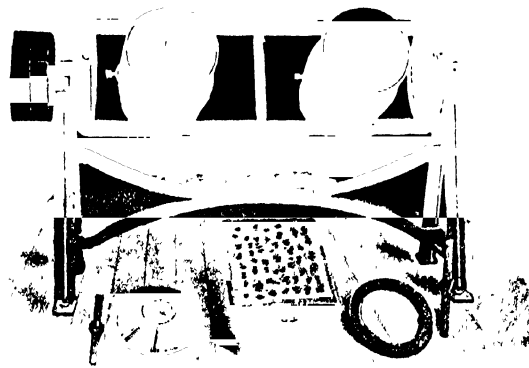
EUREKA MILL, BUILT IN 3 SIZES  
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DOUBLE JAR MILL "O" (Closed)  
Also made with single jar  
Abbé Engineering Co.

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DOUBLE JAR MILL "C" (Open)  
Abbé Engineering Co.

### TABLE OF SIZES AND CAPACITIES

See table on page 250 for sizes and capacities of Jars.

*Continued on Next Page*

## ABBÉ TUBE MILL (PATENTED)



ABBÉ TUBE MILL—TRUNNION STYLE (Patented)  
Abbé Engineering Co.

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ABBÉ TUBE MILL—TIRE STYLE (Patented)  
Abbé Engineering Co.

PRICE LIST FOR THE GENUINE DUFOUR SWISS SILK  
BOLTING CLOTH

Price Per Yard, 40 Inches Wide

Mesher per lineal inch	Num ber	Stand ard	Extra heavy X	Double Extra XX	Mesher per lineal inch	Num ber	Treble Extra XXX	Grit Gauze	XXX Grit Gauze
18	0000	\$2.45		\$2.95				No.	No.
23	000	2.55		3.00				Equals	Equals
29	00	2.60		3.10				16-0000	14-16
38	0	2.65		3.20				18	16-18
48	1	2.75		3.30				20-000	18-20
54	2	2.85		3.45				22	20-22
58	3	3.00		3.60				24	22-24
62	4	3.10		3.80				26-00	24-26
66	5	3.20		3.95				28	26-28
74	6	3.40	\$3.75	4.10	71	6	\$4.35	30	28-30
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86	8	3.90	4.25	4.55	82	8	4.80	34-0	32-36
97	9	4.20	4.60	4.85	86	9	5.05	36	34-38
109	10	4.60	4.90	5.15	97	10	5.35	38	36-40
116	11	4.85	5.20	5.40	109	11	5.65	40	38-42
125	12	5.20	5.50	5.90	116	12	6.10	42	40-44
129	13	5.40	5.80	6.30	125	13	6.50	44-1	42-46
139	14	5.70	6.10	6.70	129	14	6.90	46	44-48
150	15	6.10	6.75	7.15	139	15	7.50	48	46-50
157	16	6.75	7.30	8.00	150	16	8.50	50-2	48-52
163	17	7.50	8.00		157	17	9.50	52	50-54
166	18	9.00			163	18	11.40	54-3	52-56
169	19	10.15						56	54-58
173	20	11.20						58-4	56-60
178	21	12.00						60	58-62
200	25	14.00						62-5	60-64
								64	62-66
								66-6	64-68
								68	66-70
								70-7	68-72
								72	70

244 x 200, \$12.00

275 x 100, \$13.00

Grit-Gauze, all Nos., \$4.65

XXX Grit Gauze, all Nos., \$5.75

Cloths made up promptly and in the most perfect manner to fit any reel sieve frame.

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Particularly adapted for Pulverizing or Mixing, Dry or Wet.

These are of the batch or intermittent type, the cylinder being approximately half filled with either pebbles or porcelain balls, or metal balls. The material is put into the cylinder through a manhole opening or door, after which the tight cover is fastened securely which practically hermetically seals the mill. Then the cylinder is revolved for a given period of time (this time depending on the hardness of the material and the fineness to which it is to be ground), after which the tight cover is replaced by the grate discharge cover, and the cylinder revolved until the material is sifted through the openings in the grate, and the pebbles or balls are retained in the cylinder.

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In wet grinding, the same directions are followed except there is no casing required; also instead of replacing the tight cover with a grate cover, we provide a special cover with a valve for emptying the mill.

**Patented Manhole Frame**—(This feature can only be had with our machines)—The manhole frames of all our Pebble Mills are made with detachable flanges, so that they can be easily replaced with new pieces of flat sheet iron when the inside lining is worn out. These are the flanges that hold the lining in position and gradually wear down with the same. To users of these mills this improvement will readily appeal as an important factor, as it avoids the riveting in of new manhole frames when a machine is to be relined.

**Linings**—Our mills are lined with either best vitrified porcelain blocks, silix blocks, cast iron, steel, or wood.

## LITTLE JUMBO NO. 1 FEED MILL

This mill is attractive in appearance, durable and efficient.

Size of Pulley, 6 x 4.

Capacity, 10 to 30 bushels per hour.

Speed, 290 to 1,150 R.P.M.

Shaft, 1½ in. cold rolled.

Burr, 6 inches.

Weight, 90 pounds.

Height, 33 inches.

Made of steel and iron throughout, bearings are long and well babbitted. Mill is provided with safety springs to protect burrs from nails, nuts, etc. The screw for adjusting burrs admits of grinding grain to practically any degree of fineness desired for feed.

One set of fine burrs, also one set of coarse burrs, furnished with each machine.

Speed R.P.M.	H.P. Required	Bu. Ground Per Hour
550	1½	10
670	2½	15
800	3	20
920	3½	25
1150	5	30

Price \$35.00 net F. O. B. New York.



LITTLE JUMBO  
NO. 1 FEED MILL

Continued on Next Page

# ACME TANK COMPANY

39 Cortlandt Street  
NEW YORK, N. Y.

## PRODUCTS

Wooden Tanks for water supply, chemical and color works, and all other purposes.

Wooden Tanks and Steel Towers for village or factory, fire protection, water supply, etc.

Tanks and towers built in accordance with specifications of National Board of Fire Underwriters or Associated Factory Mutual Fire Insurance Companies.

Lead Lined Tanks.

Round or rectangular tanks with copper, brass or Monel metal rods.

## MATERIALS USED

The Acme Wood Tanks are built of California Redwood, Washington Fir, Cypress, Yellow Pine and White Cedar.

## CAPACITIES AND SIZES

Made in all sizes, round and rectangular, ranging in capacity from 50 to 500,000 gallons. The cylindrical tank is the best form of construction and cheaper than any other. Rectangular and oval tanks are only used when special requirements make it necessary.

List showing sizes, capacities, hooping, weights, etc., sent on request.

## CHEMICAL AND METALLURGICAL TANKS

Long experience has proven that California Redwood has greater acid resisting qualities than any other known material. California Redwood (*Sequoia sempervirens*) contains a natural preservative which makes it immune to the attacks of wood boring worms or



40,000 GALLON TANK AND 100' TOWER

insects, common enemies to other species of wood, and makes it impervious to the destructive action of acid and alkaline solutions.

Redwood tanks are, therefore, natural containers for the many solutions used in the chemical and metallurgical industries. When properly seasoned Redwood shrinks less than any other wood. It is not affected by extremes of temperature. It is free from pitch and resinous matter. The stock used by this Company is thoroughly seasoned, clear, air-dried Redwood, free from sap, pitch, knots or other imperfections.

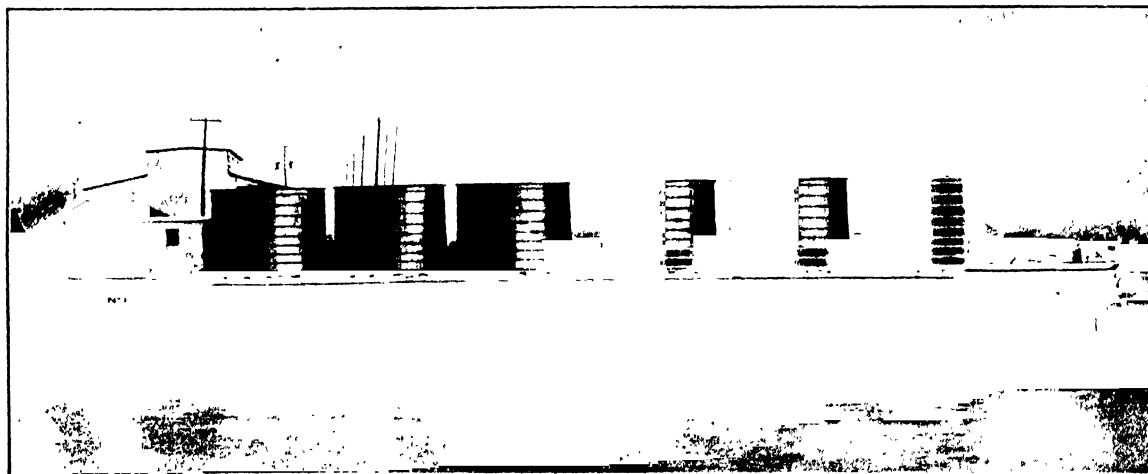
Practically every mining company in the West uses Redwood tanks for holding sulphuric and nitric acid solutions. The U. S. Government used hundreds of Redwood tanks for storage and manufacturing purposes in its various chemical and explosive plants during the recent war.

## SHIPMENTS

Shipments can be made to any part of the country from our New York, California or Illinois factories.

## GENERAL

Wood tanks are usually built of 2", 2½" or 3" material, according to the size of tank and proposed use. For special purposes they are sometimes built of 4", 6" or heavier material. We carry all of these thicknesses in stock. 2" material can ordinarily be used for capacities to 10,000 gallons.



ACME REDWOOD TANKS USED FOR STORING FUEL OIL

# WM. AINSWORTH & SONS

THE PRECISION FACTORY

DENVER, COLORADO, U. S. A.

## PRODUCTS

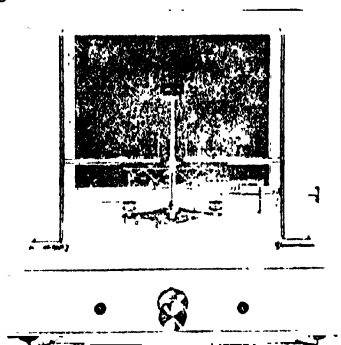
Balances, Assay, Analytical and Pulp.  
Weights, Metric of Precision.  
Transits, Theodolites and Levels.  
The Improved Type Brunton Patent Pocket Transit.

## LITERATURE

Catalog A-31 of Balances and Weights.  
Bulletin A-31 of Analytical Balances and Weights.  
Catalog B-31 of Engineering Instruments.

## ASSAY BALANCES

Supplied in both standard and inverted types ranging in sensitivity from 1/100 to 1/500 Mg. either with or without our Improved Multiple Rider Carrier which handles all fractional weights up to 50 milligrams.



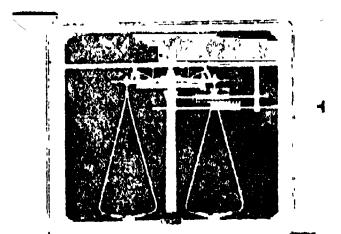
**INVERTED TYPE VB ASSAY BALANCE**  
With Improved Multiple Rider Carrier

## ANALYTICAL BALANCES

Supplied in several grades and types adapting them to the laboratory requirements of Steel, Chemical and Smelting Works, Industrial Plants and Educational Institutions.

This Type T analytical balance with Improved Multiple Rider Carrier makes for increased speed and accuracy in the laboratory. No fractional weights are required to be handled.

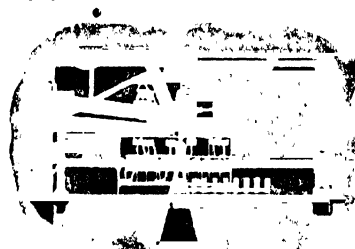
Sensitivity 1/20 Mg.



**TYPE T ANALYTICAL BALANCE**  
With Improved Multiple Rider Carrier

## IMPROVED MULTIPLE RIDER CARRIER

This device is extensively used in laboratories where speed and accuracy are prime requisites. Its use will speed up your laboratory work and quickly pay

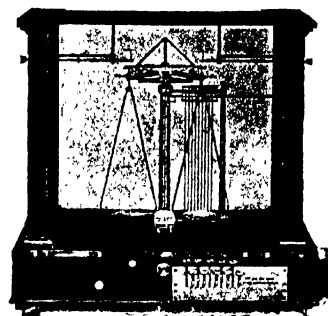


**IMPROVED MULTIPLE RIDER CARRIER**

the initial cost of attaching to any of our balances. Handles all fractional weights and has a capacity of 1215 milligrams.

## KEYBOARD WEIGHT CARRIER

You cannot afford to use antiquated balances at any price since our Type QC analytical balance with Keyboard Weight Carrier will pay handsome dividends from the start through the saving in time required for weighing. Capacity of carrier 2115 Mg. Sensitivity 1/20 Mg.

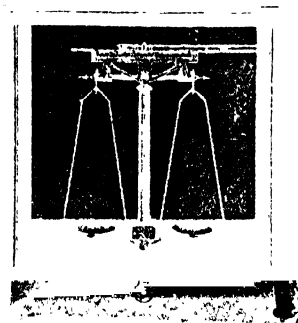


**TYPE QC ANALYTICAL BALANCE**  
With Improved Multiple Rider Carrier

## VERNIER RIDER CARRIER

This device weighs up to 50 Mg. with the rider which is also used for balancing, and attached to our Type LL analytical balance makes a low priced outfit for rapid weighing to 1/10 Mg. sensitivity.

Send for catalog.



**TYPE LL ANALYTICAL BALANCE**  
With Vernier Rider Carrier



# AJAX ELECTROTHERMIC CORPORATION

(Division of The Ajax Metal Company)

Manufacturers of

## The Ajax-Northrup High Frequency Induction Furnace

636 East State Street

TRENTON, N. J., U. S. A.

### PRODUCTS

Ajax-Northrup High Frequency Induction Furnaces, including high frequency converter systems, standard plain and vacuum type laboratory furnaces, industrial melting and annealing furnaces.

### GENERAL FEATURES

The furnace is radically new in furnace practice and secures results unobtainable by orthodox methods.

The required current is obtained through our standard high frequency converter system which operates on 110 or 220 volt 60 cycle current. It can also be adapted to other voltages and frequencies. The system is practically noiseless, is certain in operation, has no moving parts, and is to all intents and purposes indestructible.

The high frequency converter system is the relatively costly portion of the equipment. The furnaces are inexpensive and, once the system is installed, many adaptations for different heating problems are easily made by adding different standard or special inductor furnaces.

### FOR LABORATORY USE

The following features recommend the furnace for use in laboratory work:

**Exceptionally Quick Heating:** 2600° C. in 15 minutes, using chamber 2" inside diameter by 7" long, operating with 20 KW drawn from service lines;

**Accurate Temperature Control:** Infinitesimal gradations of temperature obtainable;

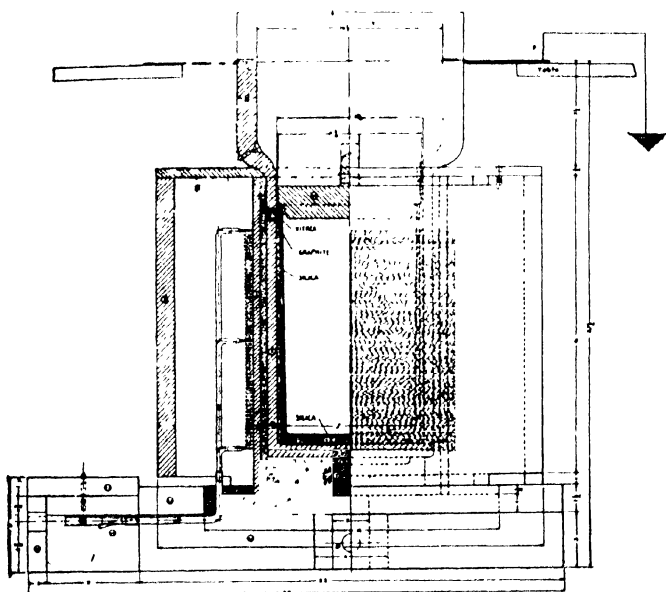


FIG. 1. CROSS-SECTIONAL VIEW OF FURNACE FOR GOLD AND SILVER MELTING WITH 18 K. W. OUTFIT

This amount of power will produce the nickel point (1452°C.), without difficulty, in this size furnace. The crucible will hold about 95 kilograms of gold.

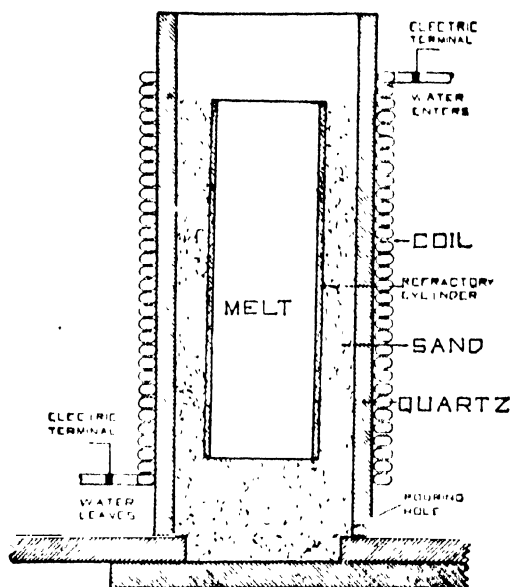


FIG. 2. CROSS-SECTIONAL VIEW OF FURNACE FOR MAKING MELTS WITHOUT A CRUCIBLE

The central "Refractory Cylinder" may oftentimes be dispensed with. This type is especially valuable for the making of carbon-free alloys.

**Furnace Cool Outside:** Making it possible to work with furnace on the hottest days;

**Quick Changing Possibilities:** Rapid changes from one material to another;

**Small or Large Melts:** Either can be made with equal facility;

**Melts in Vacuo:** Or in oxidizing, reducing or neutral atmospheres;

**Carbon Free Melts:** Conducting materials can be melted absolutely free from carbon.

### FOR COMMERCIAL USE

Platinum, Gold, Silver and all alloys of the precious metals can be melted in small lots with efficiencies far higher than those now obtainable with oil or gas.

Tool Steel and resistance and thermocouple alloys are melted by direct induction in the metals. The melt is kept absolutely free of carbon.

### FOR ANNEALING

All Metals can be annealed by direct induction. This heats the entire mass to a uniform temperature from within.

### INFORMATION

Further information covering the manifold advantage of the Ajax-Northrup Direct Induction Furnace for laboratory and commercial use will be gladly furnished on request.

# ALBERENE STONE COMPANY

223 East 23d Street, NEW YORK, N. Y.

BOSTON, MASS.  
51 Bristol St.

PITTSBURGH, PA.

BRANCH OFFICES  
CHICAGO, ILL.  
214-222 No. Clinton St.

PHILADELPHIA, PA.  
1511 Walnut St.

NEWARK, N. J.  
43 Halsey St.



## PRODUCTS

"Alberene Stone" is used for the following purposes:

- Acid Tanks
- Backs for wall tables
- Balance tables
- Bases for hoods
- Brick for furnace linings
- Drainboards
- Electrical barriers, switchboard panels, bases, and conduit
- Flooring
- Flues
- Gutters
- Hoods (Chemical)
- Hoods (Fume)
- Laboratory Fixtures
- Linings for smelting furnaces
- Pegboards for draining glassware
- Reagent shelves
- Sinks
- Supports
- Superstructure for hoods
- Sand Baths
- Steam Baths
- Strainers
- Smelting furnace linings for the sulphate, soda, and kraft pulp processes
- Table tops
- Vats
- Window sills
- Work benches

## "ALBERENE STONE"

"Alberene Stone" is the trade name applied exclusively to the output of the quarries of the Alberene



QUARRIES AND MILLS

Stone Company and serves as an identification and guarantee of quality and service. "Alberene Stone" is a natural *quarried soapstone*, gray in color, close-grained, non-porous and of uniform density and hardness, the qualities of "Alberene Stone" rendering it non-absorbent and resistant to acid and alkali, make it the most serviceable material for laboratory equipment. These qualities have made it *invaluable* for table tops, sinks, gutters, reagent shelves and fume hoods.

## FACILITIES

The quarries and mill of the Alberene Stone Company located at Schuyler, Va., are connected by the company's railroad with the Chesapeake & Ohio and the Southern Railways, insuring prompt service and delivery.

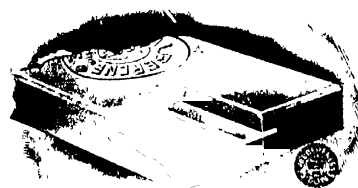
The machinery for operating the quarries and the mills is constantly being improved, thus maintaining high standards of efficiency in mill work and insuring accuracy of execution in the fulfillment of orders.

## FIXTURES

"Alberene Stone" Table Tops for Industrial, Research, Control and Educational Laboratories are proving most satisfactory.

## CONSTRUCTION

The construction employed in the installation of "Alberene Stone" is shown in the accompanying cuts. The slip-tongue joint makes possible the installation of table tops of any length which may be required. The joints made by this method are practically imperceptible.



SLIP-TONGUE JOINT

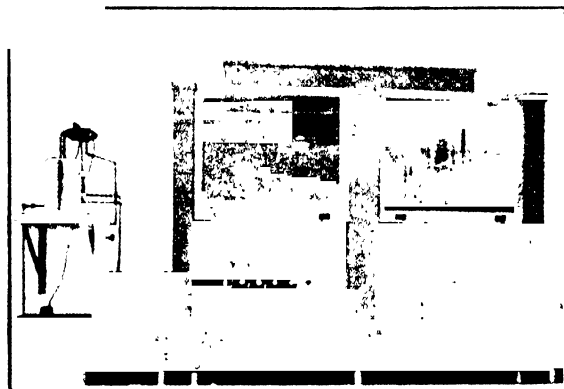
Sinks, gutters and tanks are locked together with concealed bolts and nuts and a tongued and grooved joint is employed, similar to that illustrated. This method of construction renders these fixtures perfectly watertight, and by the use of a suitable cement (such as glycerine and litharge), and protection at the joints, satisfactory resistance to the action of acid and alkali is secured.

## FUME HOODS

The non-absorbent quality of "Alberene Stone" together with its density renders it remarkably resistant to the action of corrosive fumes and makes possible the construction of a superstructure which is air, fume

*Continued on Next Page*

and gas-tight and a protection to the chemist and others at work in the laboratory. By means of proper ventilation, fumes that are heavier than the atmosphere



"ALBERENE STONE" FUME HOOD

as well as those that are lighter, may be rapidly exhausted through the vent flue.

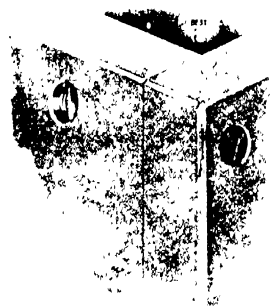
#### COST

The first cost of an "Alberene Stone" Hood is fully justified by the service which it renders. The non-corrosive quality of the material and the freedom from all upkeep charges in connection with this equipment, have been demonstrated by years of satisfactory service.

#### INSTALLATION

The Alberene Stone Company has assumed full responsibility for the delivery and erection of the equipment in the laboratories of the leading Industrial Plants and Universities, and, therefore by experience and through well-organized departments, is able to

prepare details of all equipment and to carry out the installation under the supervision of its own mechanics. These installations may be made upon foundations provided by the owners, or other contractors, or the Alberene Stone Company will assume a contract for the complete interior equipment of the laboratory, consisting of the table tops, reagent



TONGUED AND GROOVED,  
BOLTED JOINT

shelves, sinks, gutters, hoods, flooring and supports of pipe frames or cabinet work, if it is so desired. The only items which are not included consist of the plumbing and ventilation connections and fittings.

#### CARE OF EQUIPMENT

"Alberene Stone" can be kept clean and free from stains by washing, or by the use of sand-paper or sand-stone. Some chemists darken the stone by the use of oil or other preparations in order to give a uniform black finish. For microscope tables an enamel paint may be applied, if desired.

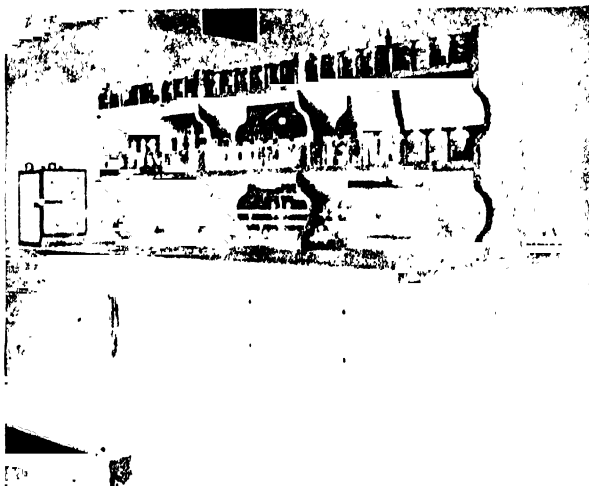
#### HEAT RESISTANCE

"Alberene Stone" is a fire stone, having a very low coefficient of expansion, and therefore withstands the heat in hood bases, and proves most satisfactory for the linings of smelting furnaces in the recovery process for sulphate, kraft and soda plants of the pulp and paper industry, and also for smelting furnaces in other industries where heat and chemical reactions create problems.

#### USERS

The best evidence of the value of "Alberene Stone" and its resistance to the action of acid and alkali is to be found by the investigation of laboratories in which it has been in use for ten, twenty or more years. A few installations are listed below:

Alberene Co. of America	New York State Board of Health
American Sugar Refining Co.	Northwestern University
Barnett Co.	Pennsylvania Railroad
Bethlehem Steel Co.	Princeton University
Catholic University of America	Queens University
Chicago University	Rockefeller Institute for Medical Research
Columbia University	Scovell Mfg. Co.
Cornell University	Southern Railway System
Crucible Steel Co.	Standard Oil Co.
E. I. du Pont de Nemours & Co.	Syracuse University
General Chemical Co.	Tide Water Oil Co.
Goodyear Tire & Rubber Co.	Toronto University
Hills Bros. Co.	U. S. Bureau of Chemistry
Jefferson Medical College	U. S. Bureau of Standards
Johns Hopkins University	U. S. Bureau of Mines
Lackawanna Railroad Co.	U. S. Mint and Assay Office
Arthur D. Little, Inc.	U. S. Navy Department
Loose-Wiles Biscuit Co.	United States Rubber Co.
Massachusetts Institute of Technology	U. S. Steel Corporation
Million Institute of Industrial Research	U. S. War Department
Morrill & Co.	Wilson & Co.
National Biscuit Co.	Worcester University
National Sugar Refining Co.	Yale University
New Jersey Zinc Co.	



"ALBERENE STONE" TABLE TOP, REAGENT SHELVES WITH SUPPORTS, FLOORING AND BASE

#### NEW USES AND SERVICE

More than thirty years of experience enables the Alberene Stone Company to supply information concerning equipment and submit details and illustrations of a wide variety of installations. Investigations are being continually made with the view to applying Alberene Stone to new uses. We can readily adapt the equipment which we furnish to the special needs of research and laboratory operation. Samples will be furnished for tests. This company guarantees its products against defective material and workmanship.

# THE ALLBRIGHT-NELL COMPANY

Manufacturers and Chemical Engineers

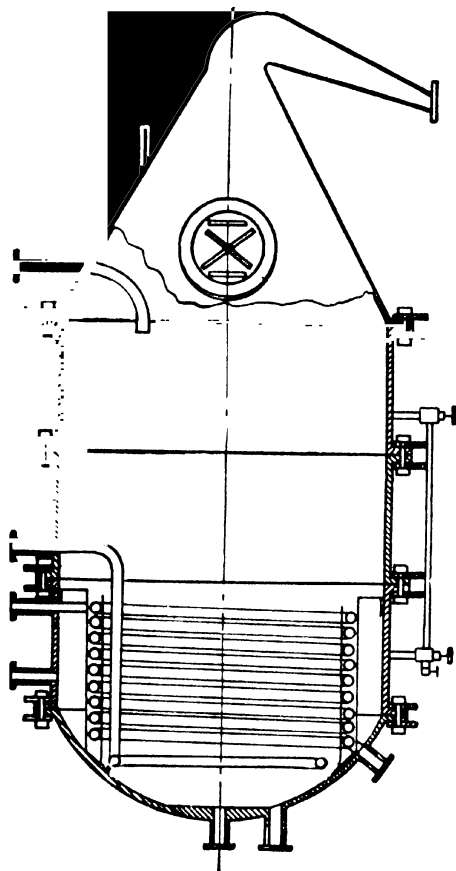
CHICAGO, ILLINOIS, U. S. A.

## PRODUCTS

Filter Presses  
Hydraulic Presses  
Knuckle Joint Presses  
Cooling Drums  
Agitators  
Dryers  
Condensers  
Evaporators  
Perfect Circulators

Complete Plants for

Edible Oil Refining and Deodorizing  
Lard Compound  
Salad Oil and Oil Hydrogenating  
Packing Houses  
Meat Canning  
Soap, Glue, Tankage, Fertilizer and Rendering



ALLBRIGHT-NELL SPECIAL OIL-TREATING TANK

## SERVICES

If our customers or prospective purchasers are confronted with any problem connected with food manufacture, whether it be increase of production, manufacture of new products, working up of by-products or disposal of waste, they are invited to refer it to this Company; and our chemical engineers, who are specialists in food products manufacture, will solve each problem without delay.

## ANCO PERFECT CIRCULATOR

A Scientifically Designed, Patented Agitator.  
Silent, Economical, Perfect Circulation.

Produces the most thorough mix in the shortest length of time.

The propellers, rotating in opposite directions, lift the liquids directly in the center, forming a continuous, even circulation, and causing every part of the liquid to be completely atomized.

The flow of the liquid picks up any solids which may settle on the bottom or sides of the tank.

$\frac{3}{4}$ -horse-power will agitate 10,000 lbs. of oil.

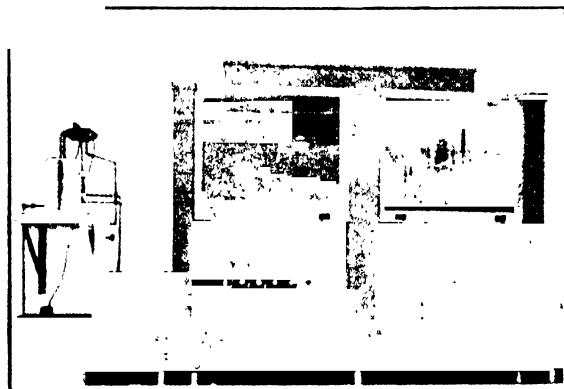
Yields greatly increased; plant losses cut down; time of operation reduced.

Built for any sized tank; of acid resisting or non-acid resisting materials; direct connected to motor or for belt drive.



ALLBRIGHT-NELL PERFECT CIRCULATOR

and gas-tight and a protection to the chemist and others at work in the laboratory. By means of proper ventilation, fumes that are heavier than the atmosphere



"ALBERENE STONE" FUME HOOD

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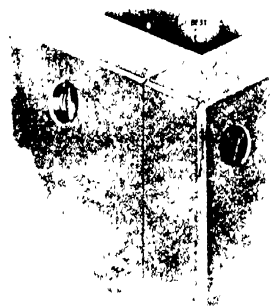
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TONGUED AND GROOVED,  
BOLTED JOINT

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Columbia University	Scovell Mfg. Co.
Cornell University	Southern Railway System
Crucible Steel Co.	Standard Oil Co.
F. I. du Pont de Nemours & Co.	Syracuse University
General Chemical Co.	Tide Water Oil Co.
Goodyear Tire & Rubber Co.	Toronto University
Hills Bros. Co.	U. S. Bureau of Chemistry
Jefferson Medical College	U. S. Bureau of Standards
Johns Hopkins University	U. S. Bureau of Mines
Lackawanna Railroad Co.	U. S. Mint and Assay Office
Arthur D. Little, Inc.	U. S. Navy Department
Loose-Wiles Biscuit Co.	United States Rubber Co.
Massachusetts Institute of Technology	U. S. Steel Corporation
Million Institute of Industrial Research	U. S. War Department
Merk & Co.	Wilson & Co.
National Biscuit Co.	Worcester University
National Sugar Refining Co.	Yale University
New Jersey Zinc Co.	



"ALBERENE STONE" TABLE TOP, REAGENT SHELVES WITH SUPPORTS, FLOORING AND BASE

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# AMERICAN ATMOS CORPORATION

Manufacturers of Self-contained Oxygen Breathing Apparatus

MEMBERS  
National Safety Council

PITTSBURGH, PA.

NEW YORK OFFICE  
105 West 40th Street

## PRODUCTS

Self-contained Oxygen Breathing Apparatus; Respirators; Pulmotors and Oxygen Inhalators.

### SELF-RESCUE TYPE

Light in weight, simple and easy to operate, readily adjustable to wear, folds compactly when not in use. Indispensable for quick service around industrial, chemical or refrigeration plants, as well as for municipal and government purposes where protection from gaseous atmosphere is essential.



SELF-RESCUE TYPE

### ATMOS INDUSTRIAL MODEL (Type 32)

The first and only short-period, self-contained apparatus provided with the perfected oxygen control feed, which automatically adjusts itself to the requirements of the operator, preventing waste or excessive accumulation of oxygen. Positive pressure, compact, simple and light in construction.

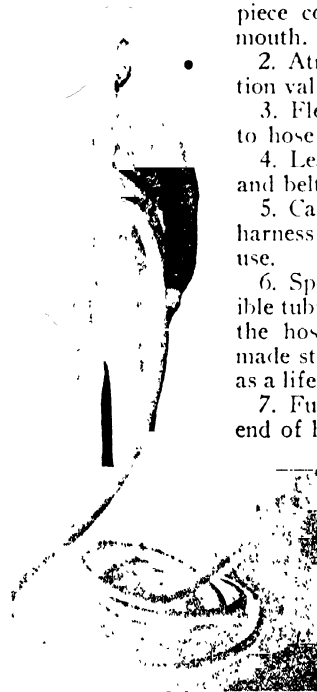


ATMOS INDUSTRIAL MODEL (TYPE 32)

### NEW ATMOS TUBULAR BREATHING MASK

Designed to provide for those industrial services requiring work in poisonous gases at short distances from fresh air and in which a simple, light and inexpensive apparatus is desired. Its essential features are:

1. Rubberized canvas face piece covering eyes, nose and mouth.
2. Atmos perfection respiration valve.
3. Flexible tube from valve to hose line.
4. Leather breast harness and belt.
5. Carrying bag on breast harness for mask when not in use.
6. Specially constructed flexible tubing or hose line. (Both the hose and connections are made strong enough to be used as a life line in emergency.)
7. Funnel with screen at free end of hose.
8. Steel stake with "S" hook attached to be used to anchor the free air end of the hose.
9. Special oxygen injector with gauge.
10. One hundred-ft. in 25-ft. lengths with couplings, specially constructed flexible tubing or hose line.



NEW ATMOS TUBULAR BREATHING MASK IN USE

### STANDARD PULMOTOR

The Standard Type of Pulmotor guaranteed to supply adequate ventilation in cases of respiratory failure, whether from drowning, asphyxiation, by noxious fumes and gases, or in obstetrical emergencies.



STANDARD PULMOTOR

# THE AMERICAN BRASS COMPANY

MAIN OFFICES  
WATERBURY, CONN., U. S. A.

Ansonia Branch,  
Ansonia, Conn.

New York, N. Y.  
195 Broadway  
Providence, R. I.  
131 Dorrance Street  
Cleveland, Ohio  
1118 Citizens Building

Buffalo Branch  
Buffalo, N. Y.

Detroit, Mich.  
455 Book Building  
Chicago, Ill.  
29 East Madison Street  
Cincinnati, Ohio  
1026 Union Central Building

MILLS AND FACTORIES

Kenosha Branch  
Kenosha, Wis.

Torrington Branch  
Torrington, Conn.

OFFICES, STORES AND RESIDENT AGENTS

Philadelphia, Pa.  
1401 Widener Building  
Boston, Mass.  
172 High Street  
St. Louis, Mo.  
Security Building

Waterbury Branch  
Waterbury, Conn.

Pittsburgh, Pa.  
904 Union Bank Building  
San Francisco, Cal.  
351 California Street

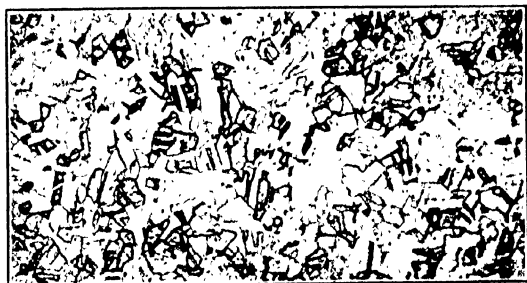
## PRODUCTS

Brass, Bronze, Copper and Nickel Silver in all forms of Sheet, Wire, Rods and Tubes.

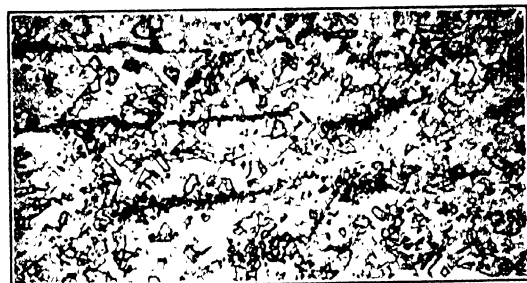
Special grades of non-ferrous alloys suitable for use in connection with the various chemical industries, including the manufacture of Explosives, Pulp and Paper, Tanning Extracts, Animal and Vegetable Compounds, Sugar, Salt, Etc.

Crucible cast and deoxidized Copper Tubes and Pipes for Conductors, Heaters, Coolers and Evaporators.

## COPPER TUBES



STRUCTURE OF ANNEALED COPPER TUBES MADE FROM CRUCIBLE CAST BILLETS



STRUCTURE OF ANNEALED COPPER TUBES MADE FROM REVERBERATORY FURNACE CAST BILLETS

The above Micrographs illustrate the fundamental superiority of Copper Tubes made from Crucible Cast Copper Billets over those made from Reverberatory Furnace Cast Billets.

Note the dark streaks in the tube made from Reverberatory Furnace Cast Billets. These streaks indicate the presence of Cuprous Oxide which hastens corrosion and results in the tube becoming pitted more rapidly than if it was free from oxide.

Note the absence of Cuprous Oxide inclusions in the tube made from Crucible Cast Billets.

American Brass Copper Tubes are made entirely from crucible cast billets and can be depended upon to give maximum service under all conditions.

## ADMIRALTY AND MUNTZ METAL TUBES

Tinned or untinned, for Condensers and Evaporators, finished by methods which insure their being of homogeneous material and giving extra long life in service.

## SHEET COPPER AND COPPER PIPE

For stills and other chemical apparatus.

## TOBIN BRONZE, PHOSPHOR BRONZE, MANGANESE BRONZE AND GUN METAL ALLOYS

For engineering uses which require non-ferrous materials of uniform high tensile strength as well as resistance to corrosion, oxidation and wear.

These Special Bronzes can be supplied in the form of Sheet, Wire, Rod and Tubes and have been used successfully for manufacturing

Coal Screen Plates  
Condenser Tube Plates  
Disc Valves for Pumps  
Diaphragms  
Plates and Bolts for Filtration Plants  
Powder Mill Plates  
Gun Powder Tools  
Pump Piston Rods and Plungers  
Valve Stems  
Lining for Hydraulic Cylinders  
Welding and Brazing stock  
Magneto Parts  
Marine instruments and apparatus  
Scales for weighing Acid

## FACILITIES

The mills of The American Brass Company are geographically located to insure prompt service to all important industrial sections of the country. These mills are equipped with extensive facilities for manufacturing a complete line of non-ferrous materials to meet the fullest requirements as to quality, finish, accuracy and dependability.

## TECHNICAL DEPARTMENT

Special metallurgical problems regarding the use and adaptability of American Brass products for the chemical industry receive the attention of an efficient technical department, the service of which is available to all those interested.

Send for price lists and illustrated pamphlets.



THE RIGID INSPECTION OF ALL FINISHED MATERIALS, INCLUDING THE HYDRAULIC TESTING OF SEAMLESS TUBES IS ONE OF THE MANY PRECAUTIONS TAKEN TO SAFEGUARD THE INTERESTS OF AMERICAN BRASS CUSTOMERS

# AMERICAN CAR AND FOUNDRY COMPANY

Manufacturers of Tank Cars for Chemicals

CHICAGO, ILL.

165 BROADWAY, NEW YORK, N. Y.

ST. LOUIS, MO.

## PRODUCTS

Tank Cars for all liquids and semi-solids, including sulphuric acid and other chemicals; Railway Cars of all types; etc.

### SULPHURIC ACID TANK CARS

Tank Cars designed to carry dangerous chemicals are built with more than ordinary care in the American Car and Foundry Company's shops. A recent construction of this type is the sulphuric acid tank car illustrated below. Fifty of these 70-ton cars (9800 gallons capacity) have been purchased by the General Chemical Company, following an initial order for two in 1916. These, as far as known, are the first 70-ton acid cars built.

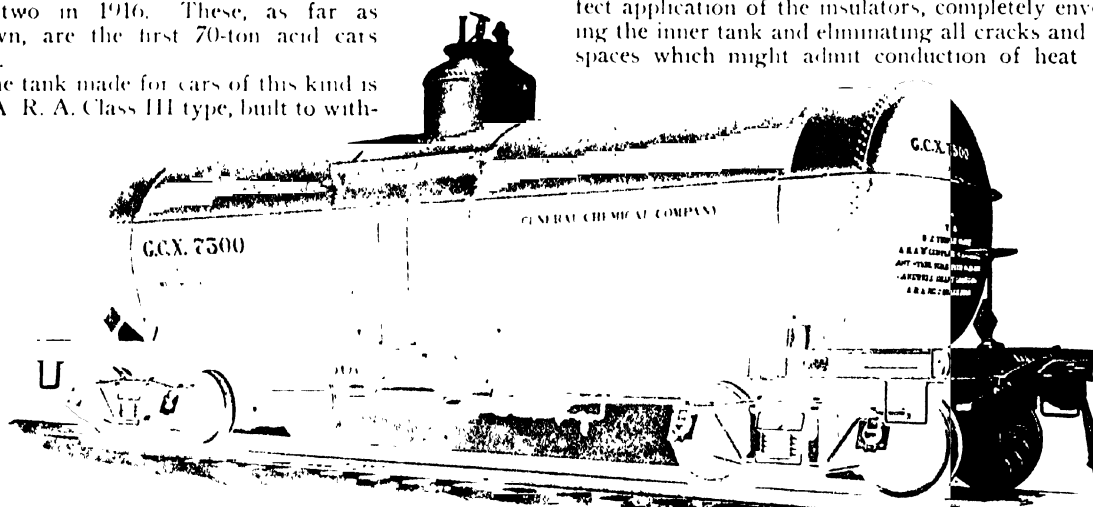
The tank made for cars of this kind is the A. R. A. Class III type, built to with-

stand a pressure of 300 pounds per square inch. Both rivets and seams are caulked on the inside and the seams are also caulked on the outside. The average light weight of this sulphuric acid car is 50,400 pounds.

### INSULATED TANK CARS

These cars are built to efficiently transport liquids which require protection from atmospheric temperatures.

Great care is exercised to obtain an isothermal container, not only in respect to the insulating materials used, and the form of construction, but most particularly in thorough workmanship which insures a perfect application of the insulators, completely enveloping the inner tank and eliminating all cracks and open spaces which might admit conduction of heat from



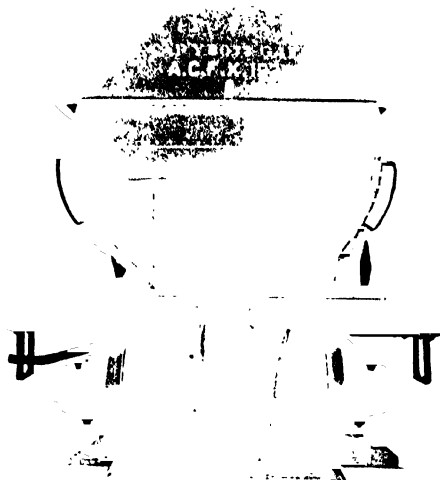
SULPHURIC ACID TANK CAR

stand a pressure of 300 pounds per square inch. It is made with three longitudinal sheets, which save several feet of riveted seams as compared with circular course construction, and this helps to eliminate any

the atmosphere to the contents of the tank, or permit loss of heat from the contents outward, as the case may be. Unless the inner tank is completely covered in this manner, the exposed surfaces defeat the insulating value of the non-conductors.

The car and inner tank construction in general conform to the standard "Car Foundry" Type 20, Class III, with the addition of special dome and fittings and tank lagging. This lagging consists of two courses of 2-ply weatherproof paper and two separate layers each of 1-inch hair felt, applied with all joints staggered and covered against any possible exposure of the inner tank. All the insulation is securely wired into place and protected by a jacket of  $\frac{1}{8}$ -inch sheet steel. The jacket is ingeniously designed to prevent the admission of water and to permit the upper section, including the dome casing, to be removed easily in one piece from the bottom and head sections. The parts of each section are riveted together and the completed sections are provided at the edges with angles for bolting into place.

The tank is tested tight at 75 pounds hydrostatic pressure, and the entire car is built under the approval of the American Railway Association and the Bureau of Explosives.



END VIEW OF INSULATED TANK CAR



# THE AMERICAN BRASS COMPANY

MAIN OFFICES  
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Ansonia, Conn.

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Kenosha, Wis.

Torrington Branch  
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351 California Street

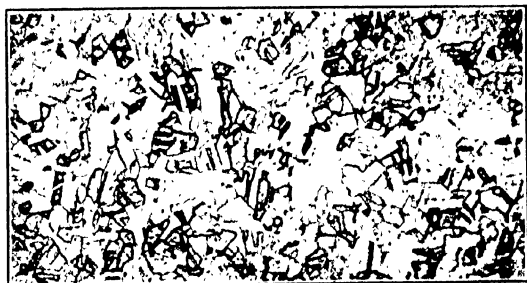
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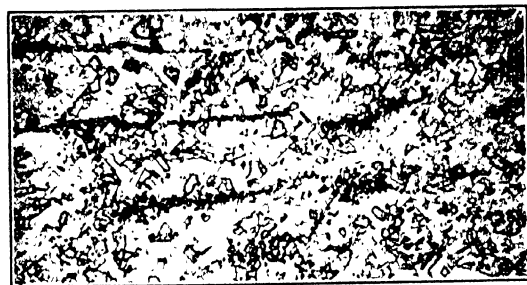
Special grades of non-ferrous alloys suitable for use in connection with the various chemical industries, including the manufacture of Explosives, Pulp and Paper, Tanning Extracts, Animal and Vegetable Compounds, Sugar, Salt, Etc.

Crucible cast and deoxidized Copper Tubes and Pipes for Conductors, Heaters, Coolers and Evaporators.

## COPPER TUBES



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American Brass Copper Tubes are made entirely from crucible cast billets and can be depended upon to give maximum service under all conditions.

## ADMIRALTY AND MUNTZ METAL TUBES

Tinned or untinned, for Condensers and Evaporators, finished by methods which insure their being of homogeneous material and giving extra long life in service.

## SHEET COPPER AND COPPER PIPE

For stills and other chemical apparatus.

## TOBIN BRONZE, PHOSPHOR BRONZE, MANGANESE BRONZE AND GUN METAL ALLOYS

For engineering uses which require non-ferrous materials of uniform high tensile strength as well as resistance to corrosion, oxidation and wear.

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Coal Screen Plates  
Condenser Tube Plates  
Disc Valves for Pumps  
Diaphragms  
Plates and Bolts for Filtration Plants  
Powder Mill Plates  
Gun Powder Tools  
Pump Piston Rods and Plungers  
Valve Stems  
Lining for Hydraulic Cylinders  
Welding and Brazing stock  
Magneto Parts  
Marine instruments and apparatus  
Scales for weighing Acid

## FACILITIES

The mills of The American Brass Company are geographically located to insure prompt service to all important industrial sections of the country. These mills are equipped with extensive facilities for manufacturing a complete line of non-ferrous materials to meet the fullest requirements as to quality, finish, accuracy and dependability.

## TECHNICAL DEPARTMENT

Special metallurgical problems regarding the use and adaptability of American Brass products for the chemical industry receive the attention of an efficient technical department, the service of which is available to all those interested.

Send for price lists and illustrated pamphlets.



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# AMERICAN FOUNDRY & CONSTRUCTION CO.

Power Piping  
Engineers, Manufacturers, Contractors  
PITTSBURGH, PA.

New York, N. Y., 469 Fifth Avenue

Chicago, Ill., 17 N. La Salle Street

## PRODUCTS AND SERVICES

**We Design, Manufacture and Install Complete Piping Systems for Power Plants and all Kinds of Industrial Plants.**

We have had particularly wide experience in the installation of piping systems for steel mills, paper mills, chemical plants, refineries, etc.

We will gladly furnish estimates for your requirements, either f. o. b., your works ready for erection, or installed complete in accordance with plans and specifications.

Our engineering department has gained through broad experience a wide range of ideas covering the piping requirements of various industrial plants, and their services are at your disposal.

## FACILITIES

Our manufacturing facilities consist of pattern shop, foundry, machine shop, pipe bending and fabricating shop and welding shop. We not only control delivery, but the quality of the materials we furnish.

Our erection department is made up of a corps of erecting engineers, specially trained for this class of work, and we can, therefore, relieve you of the many worries and details incidental to the installation of piping equipment.

## VALVES

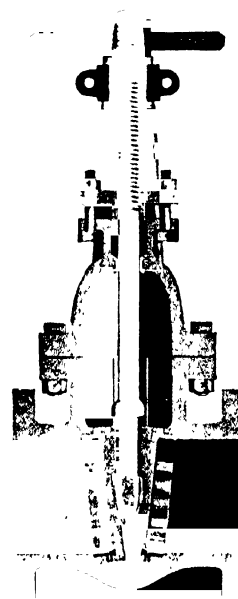
We manufacture all kinds of valves for pressures ranging up to 3000 lb. These valves are made of cast iron, cast steel and semi-steel with mountings to suit the service for which they are intended.

We also design and supply special valves for any service.

Our regular patterns include:

- Gate Valves
- Globe Valves
- Blowoff Valves
- Check Valves
- Hydraulic Valves
- Critchlow Operating Valves
- Float Valves
- Transfer Valves
- Gas Line Valves
- Drilling Valves
- Cocks

The accompanying illustration shows the internal construction of our extra heavy gate valve with double adjustable discs and one piece stem. The body is made of semi-steel or cast steel, the stem and mountings of bronze or Monel metal as required.

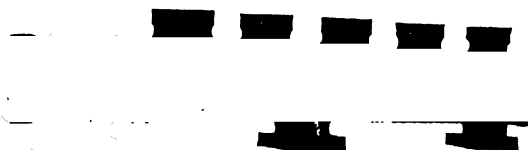


**SECTIONAL DETAIL**  
Showing interior construction  
extra heavy gate valve

## FITTINGS

We manufacture flanged and screwed fittings for any service or pressure, made of cast iron, cast steel or semi-steel. Our fittings, unless otherwise specified, are made in accordance with the "Manufacturers" or the "A. S. M. E." standard specifications.

Special fittings of any kind furnished upon request.



**SPECIAL SEMI-STEEL MANIFOLD**

*Continued on Next Page*

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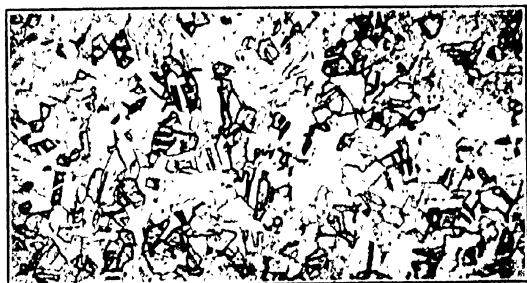
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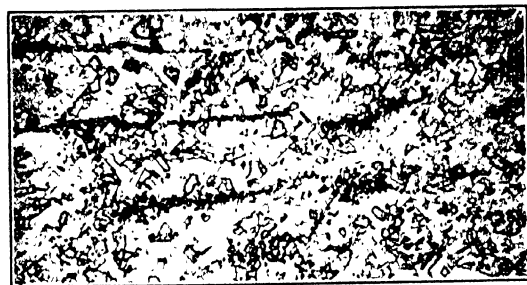
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## FACILITIES

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# AMERICAN HARD RUBBER COMPANY

Manufacturers of Hard Rubber Products

GENERAL OFFICES: 11 MERCER STREET, NEW YORK, U. S. A.

BRANCHES: Chicago, Akron, London, Paris  
 FACTORIES: Akron, O., Butler, N. J., College Point, N. Y., New York, N. Y.

## PRODUCTS

Hard Rubber pumps, pipe and fittings for the conveyance of acids, alkalis, dyes, food products, or other materials where chemical inertness is essential.

Tanks for acid storage, pickling, plating, etching, etc.

Utensils such as dippers, bottles, funnels, pails, measures, dipping baskets, frames, etc.

All kinds of special parts to specifications, with or without metal inserts.

Storage battery jars and parts, electrical insulators, etc., metal covered fans, centrifugals, frames, rollers, etc.

Hard Rubber rod, sheet and tubing.

## HARD RUBBER CHEMICAL EQUIPMENT

The remarkable inertness of Hard Rubber in the presence of the most violently corrosive liquids makes it an ideal material to use in the construction of chemical equipment. Many years of painstaking development were necessary to produce the special compounds and processes which are being successfully used today. It is now possible to furnish complete installations including tanks, pumps, piping, and the usual fittings, of this material. Contamination of solutions, replacements due to corrosion and their attendant losses in quality and efficiency are minimized and frequently eliminated by the installation of Ace quality Hard Rubber equipment.

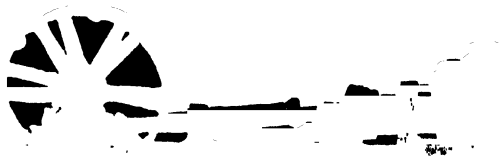
Chemical engineers trained and experienced in this field are prepared to furnish data, estimates, and specific recommendations on such equipment.

## CHEMICAL PROPERTIES OF HARD RUBBER

Hard Rubber finds its greatest application in connection with hydrochloric and hydrofluoric acids, chlorine, and bleaching solutions, acetic acid, and vinegar products, alkalis, and electrochemical liquors. There are very few chemicals which attack Hard Rubber, and to insure satisfactory service from installations, a completely equipped chemical and physical laboratory is maintained for testing and developing compounds for use with special liquors.

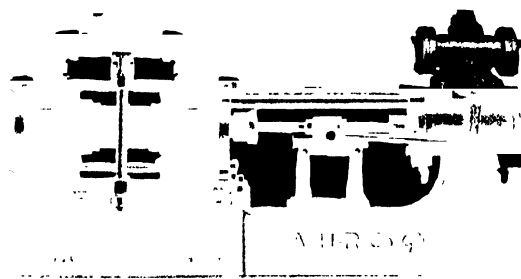
## HARD RUBBER PUMPS

All parts coming in contact with the liquid in its passage through these pumps, are of our special acid-resisting hard rubber. Conventional practise has been followed throughout in their design, and they will be found sturdy and practical in hard service.



SINGLE ACTING PUMP

Double acting pumps are made in five sizes and single acting in three. All the former may be furnished as direct acting steam pumps, with the well-known Davidson steam end, or fitted for belt or electric drive as shown on the accompanying table.



DOUBLE ACTING STEAM DRIVEN PUMP  
 TABLE OF SIZES OF RECIPROCATING PUMPS

Type	In.	Stroke, In.	Capacity, Gals. P. M.	R. P. M.	Net H. P. In.	Dis. H. P. In.	Steam In. Pipe, In.	Exh. In. Pipe, In.	Drives
Double Acting									
MA	2 1/2	4	12	150	1 1/2	1 1/2	1	1	Steam & Elec.
MB	3	4	18	150	1 1/2	1 1/2	1	1	Steam, Belt & Elec.
MC	3	6	27	150	2	1 1/2	1	1	Steam, Belt & Elec.
MD	4	8	50	115	2 1/2	2	1	1	Steam, Belt & Elec.
ME	6	10	122	100	3	2 1/2	1	1 1/2	Steam & Belt
Single Acting									
JA	2	6	6	75	1 1/2	1	1	1	Hand, Belt & Elec.
JB	3	6	10	90	1 1/2	1	1	1	Hand, Belt & Elec.
JC	3	8	14	90	1 1/2	1	1	1	Belt only

## HARD RUBBER CENTRIFUGAL PUMPS

This is our most popular pump and is admirably adapted for low head work.

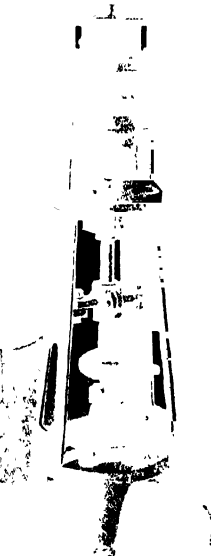
It will deliver 65 gallons per minute against a five foot head or 28 gallons against a 20 foot head. It is always supplied with motor directly mounted on pump frame, and any power characteristics may be obtained.

Write for Bulletin 10-A.

## HARD RUBBER PIPE AND FITTINGS

Hard Rubber Pipe and Fittings are all made of our special acid-resisting hard rubber. Being the same material inside, outside, and all the way through, there is no possibility of fumes, or drippings attacking the exterior of the pipe, nor can corrosion work around the lining at joints and cause invisible and dangerous weaknesses.

Briggs Standard as used on ordinary pipe is adhered to on outside diameters and threads. The wall thickness is increased slightly for



CENTRIFUGAL PUMP

Continued on Next Page

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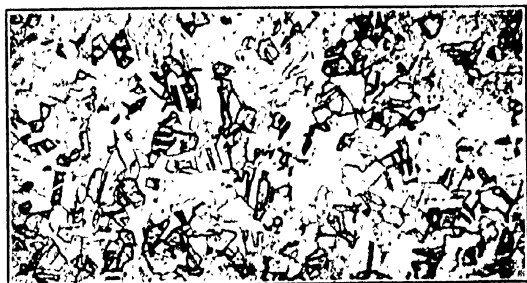
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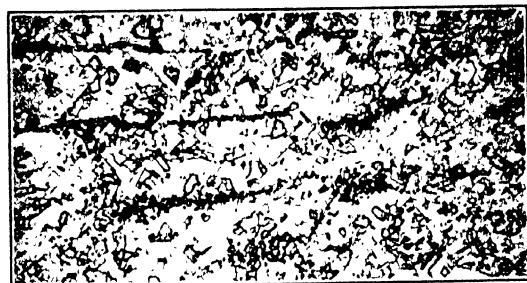
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# AMERICAN HUHNS METALLIC PACKING CO.

## Largest Manufacturers of Metal Packing in the World

### WOOLWORTH BLDG., NEW YORK, N. Y.

#### BRANCHES

Montreal, Detroit, Pittsburgh, Cincinnati, Oklahoma City, San Antonio, New Orleans, Los Angeles, San Francisco, Seattle, Calgary, Minneapolis, Chicago, Denver.

#### PRODUCTS

Special Metal Packing for any movement, for any temperature, or speed, or pressure; for all conditions of service, for the stuffing-boxes of all packing-requiring machinery.

#### USED IN EVERY INDUSTRY

Chemical Manufacturers, viz: Borax, Bleach, Cement, Coal Tar, Colors, Dyestuffs, Explosives, Glue, Match, Nitrate, Paint, Varnish, etc.; Coal and Coke Cos.; Manufacturers of Food Products, and Fertilizers; Gas and Utility Corporations; Manufacturers of Glass and Ceramics, and Iron and Steel; Mining and Smelting Cos.; Paper and Pulp Mills, Power Stations (steam, hydro, and electric); Refineries, Refrigeratories, and Refrigerating Plants, viz.: Air Conditioning, Beverage and Brewing, Canning, Chicle, Cold Storage, Confectionery, Dairy, Fisheries, Ice Cream, and Ice Manufacturers, Maltsters, Packing Houses, Pre-Cooling Stations, and Manufacturers of Syrups, Vinegar, Yeast, etc.

#### FOR EVERY CLASS OF EQUIPMENT

Accumulators	Engines	Pumps (cont.)
Autoclaves	slide	chemical
Blowers	4-valve; corliss	feed
Compressors	poppet; uniflow	oil
air (all stages)	blowing	water
ammonia	Diesel	vacuum
CO <sub>2</sub>	marine	tar
chlorine	pumping, etc.	Locomotives
gas gasoline	Presses (oil; hyd.)	Valves
expander	Pumps	air
hydrogen	ammonia	automatic
oxygen, etc.	brine	chemical
Digesters	centrifugal	steam

#### EXPLANATION OF PACKING PRINCIPLE

In all other designs, including fibrous, semi-metallic, and metallic, the pressure of the packing around the rod admittedly increases as the tendency to leakage, or the operating pressure, increases; and in direct consequence, the rods become seriously scored, and gradually tear each new set of packing to pieces. In contrast, the construction of the Huhn Ring resists the effect of pressure and blocks leakage without gripping the rod.

By eliminating, with Huhn, the unnecessary packing friction on the rod, (1) the life of the rod is increased considerably, (2) the motive power is relieved of a friction-load easily measurable in several horsepower, (3) full pressure and vacuum are readily sustained, and (4) the total savings added (5) to the long life of Huhn, make annual packing costs ridiculously low.

#### THE HUHNS SEAL

Means are provided, as shown in the cut, for the auto-feeding of graphite (or other suitable lubricant) from the reservoir of each Huhn Ring, and as none of this internal lubrication is lost either into the system or out of the stuffing-box to the atmosphere, the supply lasts indefinitely, and installations running 5, 10 and even 12 years are not uncommon.

The entire effect of the Huhn Reservoir System is to establish an internal lubricant seal, through which rods, stems, and plungers float freely and easily without packing drag, or resistance.

#### APPROVED DESIGNS

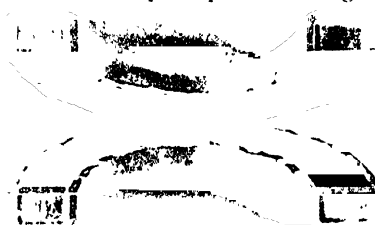
Years of successful service, handling ordinary and extreme conditions in every part of the world,—from vacuum to 5,000 lbs. pressure; from superheat to liquid ammonia; from expansion joints to high speed units—have fairly established the company and its product in the minds of the leading engineers in all branches of the industry. Our recommendations on new designs of equipment are sought and accepted, and our product has been rapidly standardized.

**The Huhn Principle**—From this basic ring more than 40 special packing designs have been produced, each on the principle of sealing the stuffing-box, in

contrast with the old-fashioned idea of preventing leakage by jamming a packing against the rod or plunger.

**Famous for Years**—This is the Huhn ring which will withstand any temperature, pressure or speed on any compressor without wear on the rod or packing.

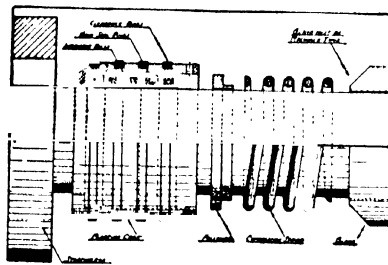
**"Float-Cage"**—In this style, the Huhn rings are contained in a cage which follows the rod at all times. For chemicals, oils and other conditions, there are other Huhn types, each for



HUHN RING SAWED IN SECTION



NH<sub>4</sub>, CO<sub>2</sub>, AND OTHER GASES



STEAM AND AIR

special requirements.

#### CONSULTATION

We are primarily packing engineers and will consider it a privilege to discuss any special packing problems. The wide variety of liquids, handled at high temperatures in the industrial chemical field, require certain designs for which Huhn is especially fitted, and our experience is entirely at the disposal of all engineers in charge of design, construction, and operation of simple or involved apparatus.

#### CONTRACT WORK

Our engineers are able to analyze the requirements of the complete plant, and will submit recommendations and proposals and guarantees on request. Simply advise full details.

# AMERICAN LEAD BURNING CO., Inc.

FORMERLY MOORE AND SIMONSON

## Lead Burning Contractors

Hudson Terminal Building

30 Church Street, NEW YORK, N. Y.

### PRODUCTS

**Lead and Lead Lined Equipment, Standard and Special.**

**Entire lead installations at plant location.**

**Expert Lead Burning for Chemical and Allied Industrial Plants.**

**Also consulting and designing for work in our field.**

**Repair and replacement and plant maintenance work.**

**Simonson-Mantius Sludge Acid Recovery Process, for which see pages of Mantius Engineering Co., Inc.**

We have had considerable experience on the following work:

#### PLANTS

Sulphuric Acid Plants  
Contact Process  
Chamber Process  
Acid Concentrators  
Pan Type  
Tower Type  
Simonson-Mantius Process  
By-Products Coke Plant  
Saturators, etc  
Pulp and Paper Plants  
Cooling Systems  
Digestors  
Metal Refining Plants  
Electrolytic Tanks  
Launder Systems  
Leaching Tanks  
Oil Refining Plants  
Agitators  
Sulphonators  
Chemical Plants  
Varied Installations  
Varied Equipment  
High Explosive Plants  
Fertilizer Plants  
Bleaching Plants  
Dye Plants

#### EQUIPMENT

Agitators  
Mixing Kettles  
Sulphonators  
Coolers  
Condensers  
Centrifugals  
Acid Eggs  
Blow Cases  
Kettles  
Still  
Pans  
Blowers  
Pumps  
Scrubbers  
Coils  
Tanks  
Towers  
Saturators  
Digestors  
Vacuum Evaporators  
Pipe  
Valves  
Special Apparatus

### SERVICES

We are equipped and organized to undertake lead work of any character whatever throughout the United States and Canada. The mechanics we employ are the highest grade men of long and thorough experience and we guarantee all workmanship to be the best that it is possible to turn out. We can undoubtedly be of considerable help to firms in the laying out of their lead work and the experience we have gained in many plants may be of particular benefit to those who may require our services.

### A FEW CLIENTS

For those who inquire as to what we have done as well as what we can do we present the names of clients, many of them well known. We cheerfully solicit investigation as to the character of our work from them.

B. T. Babbitt Co.  
United Tube Co.  
Seaboard By-Products Coke Co.  
John Yocum  
Buffalo Foundry & Machine Co.  
G. D. Jensen Co.  
National Electrolytic Co.  
Pierce Company  
Anohan Metals Co.  
Newport Chemical Co.  
American Can Co.  
H. Koppers Co.  
Westmoreland Coal Co.  
United Lead Co.  
Snead Iron Works  
Nitro Chemical Co.  
Pyrene Mfg. Co.  
Curtiss Aero Co.  
E. A. Stevenson Co.  
National Amine & Chem. Co.  
M. E. Gillett & Son  
Zinsser & Company  
Granby Cons. Min., Smelt. & Pr. Co.  
Chas. C. Moore & Co.  
Penman Littlehales Co.  
L. Sonneborn Sons Co.  
Aetna Explosives Co.  
Aetna Explosives Co.  
Aetna Explosives Co.  
Aetna Chemical Co.  
Bigelow & Nichols  
Richards & Co.  
Frank Hemingway, Inc.  
Monongahela Valley Traction Co.  
Wasson Piston Ring Co.  
Stevens-Aylsworth Co.  
Algoma Steel Corp'n  
Nitro Powder Co.  
Bayway Chemical Co.  
Acme Tank Co.  
Otto Coking Co., Inc.  
Meico Chemical Co.  
Bush & Co.  
Melrose Chemical Co.  
Foundation Company  
Columbus Crystal Co.  
Capitol Chemical Co.  
Consolidated Color & Chem. Co.  
E. C. Klipstein Co.  
F. Bredt & Co.  
Seoville Mfg. Co.  
American Color Mfg. Co.  
International Nickel Co.  
Harrison Chemical Co.  
American Synthetic Dyes Co.  
Arlington Co.  
Synthetic Chemical Co.  
Merek & Co.  
Armour Fertilizer Works  
Calco Co.  
U. S. Smelting & Refining Co.  
Morris Fertilizer Co.  
Island Refining Co.  
Butterworth-Judson Co.  
Mass. Oil Refining Co.  
Raritan Refining Co.  
Carthage Sulphite Pulp & Paper Co.  
Union Miniere du Haut Katanga  
United States Government  
United States Government  
United States Government  
Dymalkon Metals Co.  
L. A. Riley  
Warner-Klipstein Co.  
Gas & Coke Oven Corp'n of America.  
Babbitt, N. J.  
Belleville, N. J.  
Kearny, N. J.  
Irvington, N. J.  
Buffalo, N. Y.  
New York, N. Y.  
Niagara Falls, N. Y.  
Rochester, N. Y.  
Baltimore, Md.  
Passaic, N. J.  
Edgewater, N. J.  
Jersey City, N. J.  
Irwin, Pa.  
New York City  
Jersey City, N. J.  
Kingsland, N. J.  
New York, N. Y.  
Garden City, N. Y.  
Brenton, N. J.  
Brooklyn, N. Y.  
Tampa, Fla.  
Hastings, N. Y.  
Anyox, B. C.  
San Francisco, Calif.  
Syracuse, N. Y.  
Belleville, N. J.  
New York, N. Y.  
Mt. Union, Pa.  
Emporium, Pa.  
Drummondville, P. Q.  
New York, N. Y.  
Stamford, Conn.  
Bound Brook, N. J.  
Fairmont, W. Va.  
New Brunswick, N. J.  
New York, N. Y.  
Sault Ste. Marie, Ont.  
Kingstown, N. Y.  
Bayway, N. J.  
New York, N. Y.  
New York, N. Y.  
Bayonne, N. J.  
Linden, N. J.  
Newark, N. J.  
New York, N. Y.  
Newark, N. J.  
New York, N. Y.  
Newark, N. J.  
Charleston, W. Va.  
New York, N. Y.  
Waterbury, Conn.  
Passaic, N. J.  
Port Colborne, Ont.  
Newark, N. J.  
Newark, N. J.  
Newark, N. J.  
Newark, N. J.  
Rahway, N. J.  
Chrome, N. J.  
Bound Brook, N. J.  
Chrome, N. J.  
Atlanta, Ga.  
Prospect, La.  
Newark, N. J.  
Boston, Mass.  
Greensand, N. J.  
Carthage, N. Y.  
New York, N. Y.  
Puget Sound, Wash.  
Willoughby, Ohio  
Edgewood, Md.  
New York, N. Y.  
New York, N. Y.  
Chrome, N. J.  
New York, N. Y.

# AMERICAN MACHINERY COMPANY, INC.

Manufacturers of Weighing and Filling Machinery NEW YORK OFFICE  
799 BROADWAY

MAIN OFFICE AND FACTORY

330-348 NORTH 12TH STREET, PHILADELPHIA, PA.

## PRODUCTS

Machines for automatically weighing and filling all dry, semi-pastes, paste and crystal compounds.

### SERVICE

We will gladly send our engineering experts to consult with you on your problems of weighing and filling all classes of materials.

### "LITTLE WONDER" AUTOMATIC SCALE

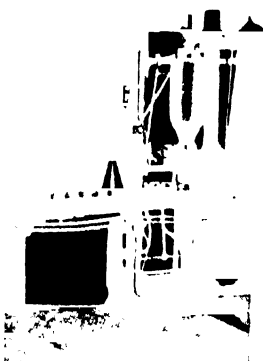
This machine is designed to handle free flowing powders and crystals of light gravity. One operator can handle 1500-1800 packages per hour with ease. The feeder device can be instantly set for 14 different speeds. Capacity from 2 oz. to 1 lb. per charge in weighing hopper for model No. 1, to 6 lbs. per charge for Model 2. Two other sizes which are larger are special machines. All four sizes are net weight machines.



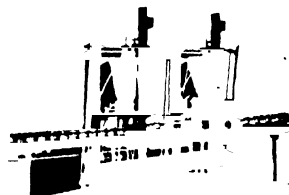
LITTLE WONDER SCALE

### AMERICAN AUTOMATIC SCALES MODEL K-1 GROSS WEIGHT

This machine is used for products that are hygroscopic and require rapid filling and large spout-room to prevent packing. The illustration below shows the machine in operation filling Caustic Soda into containers.



MODEL K-1



MODEL K-2

### "AMERICAN" AUTOMATIC SCALES MODEL K-2 GROSS WEIGHT

This machine is similar to K-1, except that it is used where the material does not pack tight and has to be jarred to make it settle, and then a second filling is necessary to give the exact full weight. The first machine fills the container in a large stream, while the second, or finishing scale, completes the weighing by filling in a small stream.

### AMERICAN TOP AND BOTTOM CARTON SEALER

The most inexpensive, simplest in construction and practical machine ever produced.

Capacity 35 filled and sealed cartons per minute.

### "AMERICAN" AUTOMATIC SCALE MODEL B

A net weight machine rated at 1200 to 2000 packages per hour according to size. It has adjustment for 20 different speeds of feeding. This machine can be equipped with a compressor device for packing into canisters or solid bricks and is adjustable to all shapes and sizes of containers;  $\frac{1}{4}$  H.P. required, and floor space 33 inches by 33 inches.



MODEL B IN CONJUNCTION WITH ENVELOPE SEALER

### "AMERICAN" ENVELOPE AND BAG SEALER

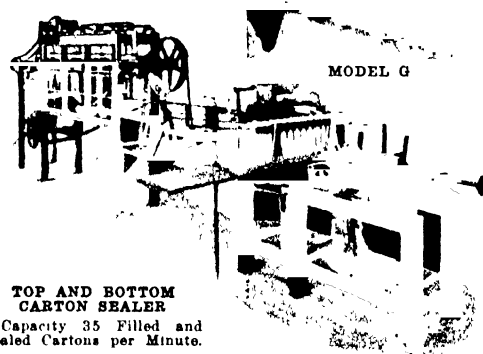
Combination Equipment and weighs, fills, seals samples of all kinds of products such as drugs and pharmaceuticals, food products, perfumes, seeds, etc. Capacity 25 to 30 envelopes or bags per minute with one operator.

### "AMERICAN" UNIVERSAL ELECTRIC WEIGHER AND FILLER MODEL G

A gross weight machine for a wide variety of products, in all types of containers, such as foods, spices, tales, drugs, and all powdered or fine granulated goods, under high pressure or none.  $\frac{1}{2}$  H.P. and floor space 3 feet by 3 feet, capacity about 30 packages a minute.



MODEL G



TOP AND BOTTOM CARTON SEALER

Capacity 35 Filled and Sealed Cartons per Minute.



# AMERICAN MANGANESE BRONZE COMPANY

Manufacturers of  
High Grade Bronzes for Engineering Purposes  
HOLMESBURG, PHILADELPHIA, PA.

Cleveland, 1006 Guardian Bldg

Detroit 1714 Woodward Ave.

Pittsburgh 316 House Building

Montreal, 285 Beaver Hall Bldg

## PRODUCTS

### Bronze Castings

Ingots

Forgings

Rolls

Rods

Shapes

Hydraulic and Acid Resisting Bronzes.

### HY-TEN-SL BRONZE

Is the strongest of all bronzes, being about equal to Nickel Steel. It is a homogeneous alloy of close, even texture and can be readily cast into difficult shapes. It can be forged, rolled or extruded hot. It is non-magnetic and non-corrosive.

### MANGANESE BRONZE

Where a combination of strength and acid resistance is required, Manganese Bronze is the ideal Metal. No other Bronze withstands the action of Acetic Acid as well as does Manganese Bronze.

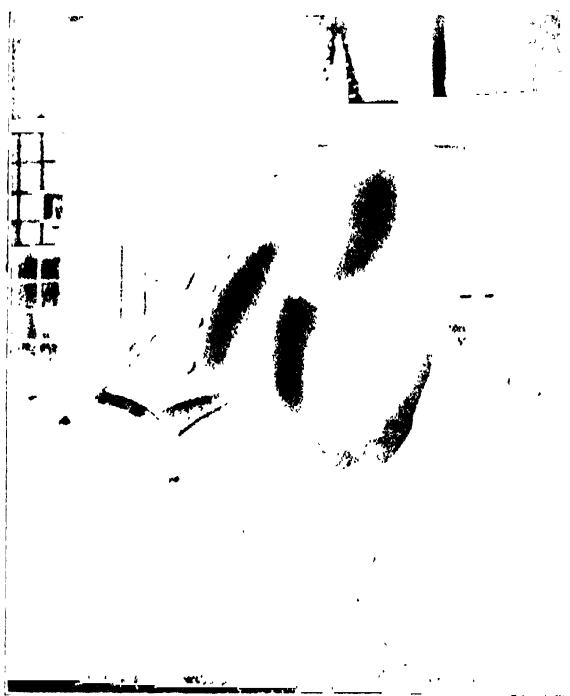
Our Manganese Bronzes show a uniform grain; they are tough, ductile and non-corrosive, with the equivalent tensile strength and elongation of medium carbon steel. Forging and rolling increase the yield point and produce a fibrous structure. Intricate castings can be poured from this metal.

### ACID RESISTING BRONZE

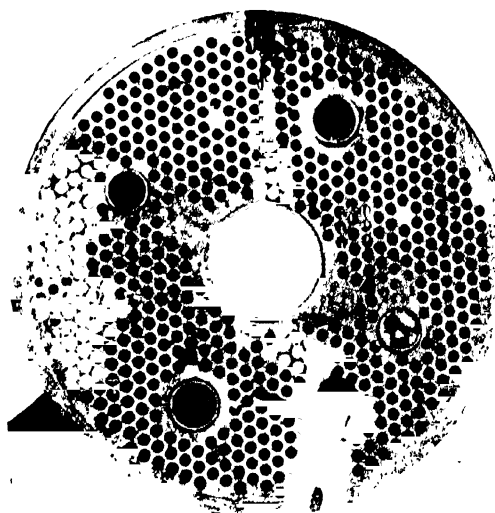
Our acid resisting bronze is made to withstand the action of weak Sulphuric Acid; this makes it especially valuable where such a condition is to be met.

AVERAGE PHYSICAL PROPERTIES OF SPARE'S BRONZES  
In Tension

Grade of Bronze	Form	Tensile Strength per Sq. Inch in Pounds	Yield Point per Sq. Inch in Pounds	Elongation in 2 Inches %	Reduction of Area %
HY-TEN-SL Bronze	Castings	105,000	60,000	15.0	15.0
HY-TEN-SL (Gear)	Castings	90,000	42,000	20.0	20.0
Manganese SMB	Castings	70,000	35,000	30.0	30.0
Manganese AMB	Castings	62,000	30,000	25.0	25.0
Naval	Rolled and Forged	54,000	25,000	40.0	45.0
Phosphor No. 1 U. S. Gov't	Castings	25,000	18,000	4.0	30.0
Gun	Castings	40,000	20,000	20.0	20.0
Acid Resisting	Castings				



CENTRIFUGAL PUMP CASING OF ACID-PROOF BRONZE  
Made by us in 1914, still in continuous use



ONE OF 12 BRASS CONDENSER TUBE SHEETS  
Made by us. Diameter—18' 9". Weight 5000 lbs.

# THE AMERICAN METAL HOSE COMPANY

## WATERBURY, CONN.

Canada  
Lytle Engineering Co., Limited  
Montreal, Canada

84 Batterymarch St., Boston, Mass.  
173 Lafayette St., New York City

### SALES OFFICES

29 East Madison St., Chicago, Ill.  
Union Bank Building, Pittsburg, Pa.

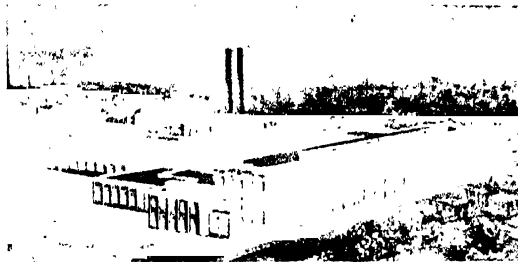
Pacific Coast  
F. Somers Peterson Co.  
San Francisco, Cal.

### PRODUCTS

American Flexible Metal Hose and Tubing, for  
Oil Gasoline  
Steam Paint  
Air Varnish  
Gas Etc.

### MANUFACTURING FACILITIES

With 50,000 ft. of floor space devoted exclusively to the manufacturing of **American Flexible Metal Hose**, with the most modern types of equipment ob-



FACTORY: WATERBURY, CONN.

tainable, and with large stocks of finished Hose at all times on hand, we are in a position to render service par excellence.

### ADAPTABILITY

While adapted to all Hose duties, **American Flexible Metal Hose** is primarily a heavy service Hose, and its principal fields are in the hardest and most severe classes of work. Its economy and efficiency are most pronounced in those duties where rubber hose on account of chemical action or intense heat can at best last but a very short time. We, unqualifiedly, recommend our Hose for the conveying of Oils, Steam, Air, Gas, Gasoline, Paints, Varnish, etc.

### STEAM HOSE

**American Flexible Metal Steam Hose, BD15 and BD20 Bronze** is used for the conveying of Steam in numberless connections. It won't rot; it can't burn out; neither heat nor pressure affects it. Principal uses: Blowing Boiler Tubes; General Conducting of Steam and as Flexible Joints on Steam Presses.

### OIL HOSE

Our **Oil Hose** is of the same construction as the Hose we furnish for Steam but it is made of heavily



### UNLOADING TANK CAR WITH AMERICAN METAL OIL HOSE

Galvanized **Steel** instead of Bronze. It is cheaper than the best grades of rubber oil hose and will last indefinitely longer.

**American Metal Oil Hose** is absolutely immune to the action of Oils. All Oil Companies use it; the U. S. Navy Department uses Flexible Metal Oil Hose exclusively.

### HOSE PROBLEMS

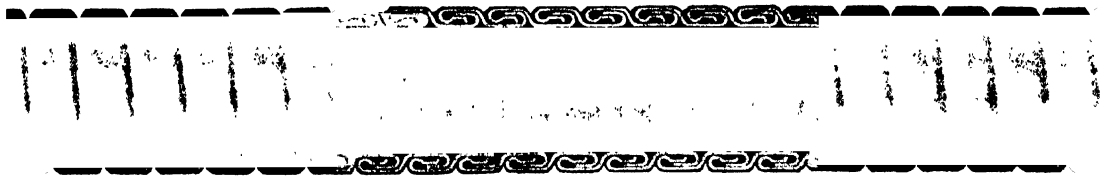
Most hose problems are simple; a large percentage arise from the use of unsuitable hose. We can help you in any Hose problems you may have; our experience is at your disposal.

TEST TABLE: BD15 FLEXIBLE BRONZE HOSE

Diameters of Hose, in		Approximate bending diameter, in	Weights per foot, lbs	Test Pressures per sq. in. — lbs	
Inside	Outside			Straight	Bent
1 1/4	1 3/4	4	11	500	400
1 1/2	1 7/8	6	25	500	400
1 3/4	2	7	40	500	400
2	2 1/4	12	80	500	400
2 1/4	2 3/4	14	100	500	400
2 1/2	3	18	150	400	300
3	3 1/4	22	175	400	300
3 1/4	3 3/4	26	275	300	200
4	4	32	315	250	150
4 1/4	4 1/4	38	450	250	150
4 1/2	4 1/2	44	675	200	75
5	5 1/4	50	875	200	75
5 1/2	5 1/2	56	1100	150	75

Steel Hose is approximately 10% lighter than Bronze

(Above test pressures are from latest U. S. Naval specifications on flexible metal hose and are used by us as standard)



SECTION OF 3/4" BD15 INTERLOCKED HOSE (ACTUAL SIZE)

# AMERICAN PLATINUM WORKS

Platinum, Gold and Silver Refiners

Manufacturers of Finest Quality Laboratory Ware  
225-231 N. J. R. R. AVE., NEWARK, N. J.  
NEW YORK OFFICE, 30 CHURCH STREET

## PRODUCTS

Platinum for all purposes as required by chemists and allied lines: Metallurgists, Chemical Supply Houses and Manufacturers: Platinum Laboratory Apparatus of Standard and Special Design. Platinum Metal Salts. Gold and Silver.

Palladium and all metals of the platinum group.

## PLATINUM CRUCIBLES

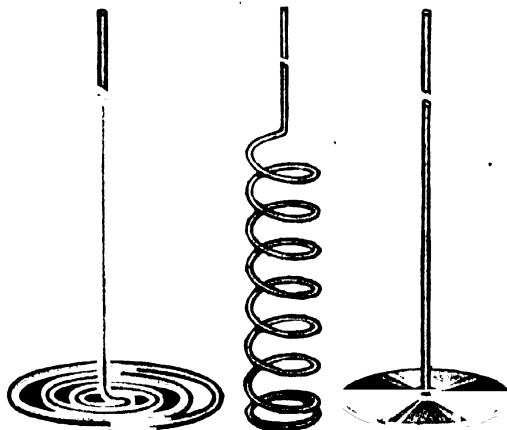
Standard weights and sizes in stock. The use of finest grade metals assures a product free from defects, permitting maximum results with minimum labor. We also manufacture special shapes and sizes to order, including crucibles of Gold or Silver and Goldlined Platinum Crucibles.



CRUCIBLE

## ANODES AND CATHODES

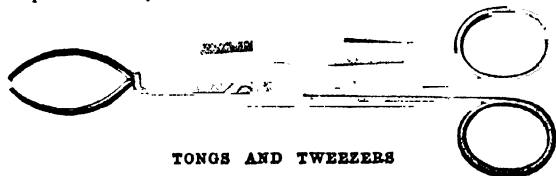
Made of finest quality platinum in all standard sizes and shapes and to order.



ANODES AND CATHODES

## TONGS, TWEEZERS, ETC.

Nickel Crucible Tongs, with solid or hollow platinum tips. Finest quality throughout. Platinum tipped tweezers of various types, also standard sizes of platinum spatulas.



TONGS AND TWEEZERS

## PLATINUM DISHES

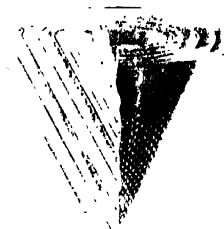
Platinum Dishes in any form, round or flat bottoms, with or without lips for all purposes



DISH

## FILTER CONES

Seamless Platinum Filter Cones—perforated .020 inch. All sizes. Specially made cones perforated .016-.025 inch—to order.

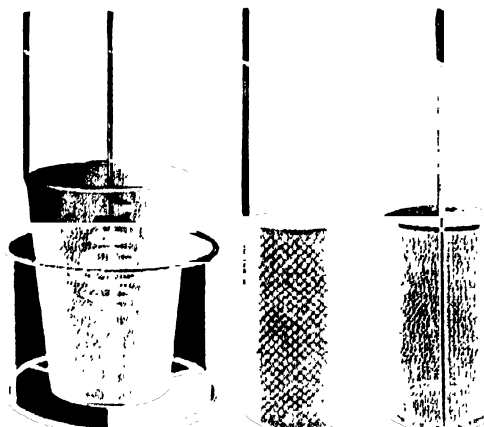


CONES

## WIRE GAUZE AND PERFORATED SHEET ELECTRODES

Carefully and accurately made electrodes of all standard shapes and sizes—either gauze or perforated sheet. Our Electrodes give the maximum of satisfactory service.

Made for any standard electrolytic apparatus. Also to specifications of standard authorities.



GAUZE AND SHEET ELECTRODES

CATALOG K-15—SENT ON REQUEST

# AMERICAN PROCESS COMPANY

## Drying, Pressing and Cooking Machinery

68 William Street, NEW YORK, N. Y.

### PRODUCTS

Dryers, Presses, Digesters and Cookers

### AMERICAN PROCESS MACHINERY

Distinguishing features of American Process Company's machinery are its automatic, continuous and uniform action.

**Advantages** (1) Product is uniform; (2) labor is reduced to a minimum; (3) wear and tear of starting, stopping and reversing or otherwise changing the load are eliminated, thus prolonging life of machine far beyond that of similar types; (4) economy in fuel consumption, heat being applied direct; (5) saving in power and increase in capacity by continuous action.

**Scope of Use** The dryers manufactured by American Process Company will handle any kind of animal, vegetable and mineral materials, organic or inorganic matter, solid or liquid. They are operated either by direct heat or steam heated air.

Continuous screw presses, of different construction, for separating any solid matter from its liquid, can be adapted for slaughter house tankage (residuum of fats), as well as for pressing fish and reclaimed rubber.

Digesters and cookers to meet all conditions.

### DRYERS



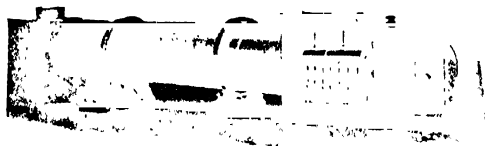
SAND, ORE AND FERTILIZER DRYER

Direct heat rotary dryer, with gear ring. Materials and gases travel in same direction. Erection of dryer with furnace can be performed by any competent mechanic. Wet material and furnace gases enter shell together at higher end. Wet material falls to bottom of shell, is caught by an interior shell, elevated to almost highest point of rotation, and then falls again through furnace gases. This operation, with highest temperature in contact with wettest material, continues until dried material is discharged through lower end of dryer.

DRYER, CAPACITIES AND DIMENSIONS

No.	Capacity (lbs.), sand, ore, etc. per hour, when 5% moisture	Capacity (lbs.), of fertilizer, etc., when 50% moisture	Horse power	Shipping weight, in lbs.	Floor space
C II	10,000	1,000	5-8	10,000	27' 6" x 6' x 6' 6"
C III	20,000	2,000	8-12	12,000	32' 6" x 6' x 6' 7"
C IV	30,000	3,000	10-15	15,000	37' 6" x 6' x 6' 7"
C V	40,000	5,000	15-20	28,000	42' 6" x 9' x 8' 9"
C VI	50,000	8,000	20-25	30,000	50' 6" x 9' x 9'

We also manufacture counter current dryers and brick lined, roasters.

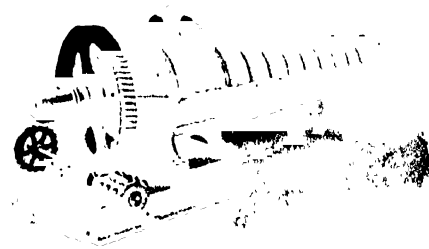


STEAM HEATED AIR DRYER

For drying Borax, Baking Powder, Sulphate of Ammonia and other Chemicals.

### AUTOMATIC CONTINUOUS SCREW PRESS

This press is self-contained and of continuous screw type, consisting of a horizontal tapered screw, built up on a hollow perforated shaft and arranged to allow admission of steam, if desired. Screw fits closely inside of a similarly tapered slatted curb and rotates. Material, forced into conveyor portion of screw, then into curb, must move towards small end of press as screw turns. Size of discharge opening is regulated. Drainage is both internal and external. To regulate supply of material, a patent feeder is furnished.

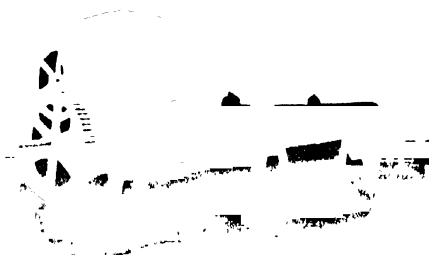


CONTINUOUS SCREW PRESS

For pressing fish, slaughter house tankage (residuum of fats, etc.), reclaimed rubber, etc. Material fed in at one end and discharged at the other, liquids forced out between slats, into drainage hole of shaft, thence to a tank. Built in all sizes.

### AUTOMATIC CONTINUOUS DIGESTER AND COOKER

Direct steam, self-contained type and operated continuously. A screw conveyor (inside a cylindrical shell) rotates and thoroughly agitates material and carries it forward. Steam admitted through perforations in hollow shaft of conveyor. Note forced rotary feed at admission end. Liquid and solid matter are discharged together, thence to a tank. Drainage tank can be built at small expense.



AUTOMATIC CONTINUOUS DIGESTER AND COOKER

Feeds, digester proper and discharge all driven by sprockets and chain belt. Very little vibration, and digester can be erected in upper stories of building. Built in all sizes.

### CO-OPERATIVE SERVICES

Complete drawings and directions are always furnished for the erection and operation of dryers and, generally, no outside assistance is required. Recommendations made and, if desired, an engineer will be placed in charge of the installation.

### REFERENCES

Lists of satisfied users sent upon application.

# AMERICAN PULVERIZER CO.

GENERAL OFFICES AND WORKS

18TH AND AUSTIN STREETS, ST. LOUIS, MO.

## PRODUCTS

Manufacturers of the American Ring Pulverizer. (Patented.)

## ADAPTABILITY OF OUR STANDARD MACHINES

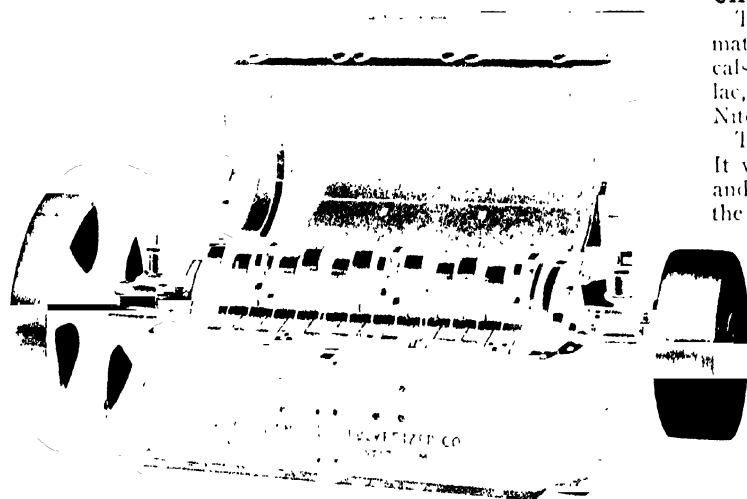
These machines will crush 10" lumps to a powder; any desired material, such as Shale, Coal, Coke, Barytes, Phosphate Rock, Limestone, Asphalt, Quartz Rock, Bone, Clinkers, Sandstone, Carbon, Ore, Rock, Granite Rock, Slag and similar hard substances.

## ROLLING RING ACTION OF THE AMERICAN PULVERIZER

In all centrifugal machines the rigidity of the running members, with the consequent friction losses, is the reason for high power consumption.

The American Pulverizers Ring System is flexible and therefore reduces the necessary motor power. The Rings with a 6" inside diameter are suspended by 2" shafts, therefore can be thrown back 4" when larger pieces are blocking their passage and roll over foreign material without damage to the machine.

Its flexibility guarantees against any damage by foreign material.



NO. 37 AMERICAN RING PULVERIZER  
Open for inspection. Equipped with rolling and shredder rings.

## 600 REVOLUTIONS PER MINUTE

Its crushing and grinding is done by the Rolling Ring, not by a blow like a Swing Hammer. 60% of the weight of the Rings can be used before replacement is necessary.

Corresponding to the raw material our different type of rings can be applied in the same machine, making it a Pulverizer, Crusher, Shredder or Disintegrator.

## MADE IN 8 SIZES

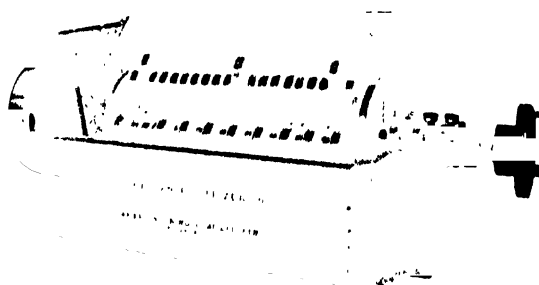
Cost of Power, Labor, Wear and Tear. Limestone dust, 10 to 15 cents per ton; coal crushing, 3 to 5 cents per ton. Further particulars on request.

## COAL CRUSHERS

The ideal machine for coal and coke is the American Ring Crusher.

The product is a finished stoker coal without re-screening, with the least horse power and smallest amount of dust.

The machine will dispose of any foreign material contained in the coal automatically and crush all the pyrite without any trouble.

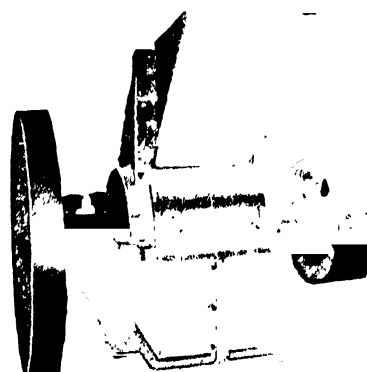


NO. 60 COAL CRUSHER  
With three lifted rings and side housing removed.

## CHEMICAL MACHINES

The low speed prevents heating of the material and allows to pulverize all chemicals with low melting points as Alum, Shellac, Dancing Floor Wax, Intermediates, Niter Cake, Nitrate of Soda, etc.

The machines will not clog and gum up. It will handle man-sized lumps and crush and grind the same in one operation to the required fineness.



AMERICAN RING PULVERIZER NO. 13  
For chemical factories.

## NO EXTRA BREAK REQUIRED WITH THE AMERICAN RING PULVERIZER

The American Ring Pulverizer is a One Unit Machine. No rehandling is necessary and therefore it saves labor, Elevators, wear and tear and power.

It requires less working space and therewith reduces the cost of the building and foundation necessary.

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## AMERICAN STAVE & COOPERAGE CO.

Incorporated

57 Pearl Street  
CHELSEA, MASS.

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### PRODUCTS

#### Wooden Tanks for

Agitating  
Generating  
Mixing  
Separating  
Settling  
Straining  
Storing  
Tumbling

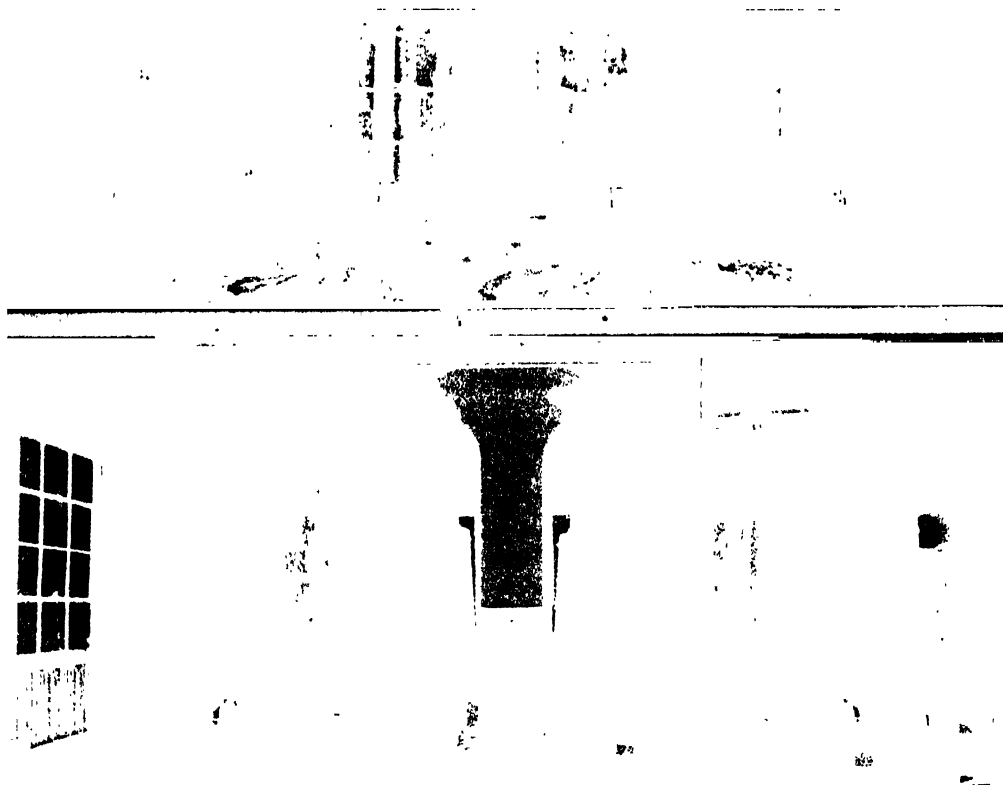
#### Kegs and Barrels for

Liquids  
Semi-liquids

### TANK INSTALLATION

The illustration below is of tanks, designed and erected by us in the modern extract plant of The Joseph Burnett Co. The liquid is first percolated in specially designed hogsheads, eight of which feed one of the small tanks shown on the upper floor. After going through the process there it is transferred by gravity to the large storage tanks below, one of which receives the contents of four of the small tanks. There are thirty-two of the smaller tanks, which are made from prime white oak to hold the alcoholic contents.

The eight large tanks were made by us about eighteen years ago for Sherry storage, and were subsequently bought by The Burnett Co. It was necessary to rebuild these tanks and now they are as good as new, the stock being perfectly sound.



---

TYPICAL TANK INSTALLATION MADE BY US

# AMERICAN STEAM GAUGE & VALVE MFG. CO.

Established 1851

MAIN OFFICE AND WORKS: BOSTON, MASS.

BRANCH OFFICES

NEW YORK

CHICAGO

PITTSBURGH

ATLANTA

LOS ANGELES

## PRODUCTS

**Gauges—Both Indicating and Recording for Steam, Water, Air, Oil, Gas, Hydraulic, Ammonia and all other pressures; also Vacuum and Compound.**

**Gauge Testers, Engine Room Clocks, Revolution Counters.**

**Pop Safety and Relief Valves, Steam Whistles, Engine Indicators, Feed Water Grease Extractors, Steam Traps.**

### AMERICAN GAUGES

All parts subject to wear are of rugged construction and made of specially hard, wear-defying metal. The segment and pinion have unusually wide face to reduce wear.

Each dial is individually hand calibrated, insuring absolute accuracy.

Catalog No. 70 sent on request.

### AMERICAN RECORDING GAUGES

Have the very highest grade dust-proof clock movement made, insuring accurate records.

The fountain pen used will not leak and holds sufficient ink to last one month.

Throughout, the materials used have been selected with the idea of giving long wear.

The standard chart is 8", for a 24-hour record, but special charts can be furnished.

Catalog No. 70 sent on request.

### AMERICAN POP SAFETY VALVE

The American is very simple in construction and has fewer working parts than other valves.

All adjustments can be made from the outside without taking valve apart. Bushings never leak.

Every valve is guaranteed to open promptly at the pressure stamped thereon and to close just as promptly with a minimum loss of steam.

Before leaving our factory, every valve is tested under actual working steam pressure.

Catalog No. 70 sent on request.

### AMERICAN-THOMPSON IMPROVED INDICATOR

This is the original Thompson Indicator and has features found in no other make. The detent motion makes it possible to take as many cards as desired without unhooking cord, and the cord will remain at same tension.

Cards can be made in less time than is possible without the ex-

clusive American detent motion. In addition, these cards are by far the most accurate due to the short arm and limited movement of pencil.

Exposed spring is free from temperature changes and can be changed with utmost facility.

This is the most perfect, most facile and most durable of all Indicators.

Send for American-Thompson Indicator Catalog.

### AMERICAN IDEAL STEAM TRAP

This trap is built on extremely rugged lines and is guaranteed for all pressures.

Has a valve discharge orifice much larger than in ordinary traps, which means larger capacity. Consequently a smaller trap can be used. It also enables dirt and scale to pass off and prevents clogging. Valve seat can be renewed without making disconnections.

A heavy Hercules float is used, made of seamless, non-corroding copper. It will resist pressures up to 600 lbs. to the square inch and is guaranteed for the life of trap.

Valve seats are under a continuous water seal, thus cannot leak live steam.

Send for booklet, "A Steam Trap Catechism."

### AMERICAN H<sub>2</sub>O GREASE EXTRACTING FEED-WATER FILTER

This device makes it impossible for oil to get into the boiler, thus preventing dangerous bagging plates and oil caked tubes. Keeps heating surfaces clean, increases steaming capacity and lowers coal bills.

Filtering surface is equal to many times the area of feed-water pipes. Has device for applying a reverse steam current for temporary cleaning.

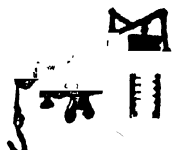
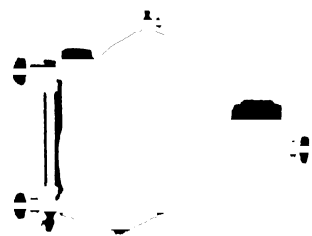
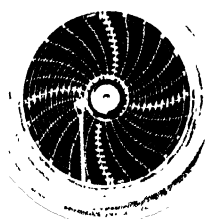
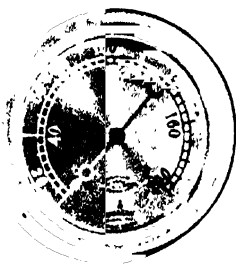
Renewals are easy to make. Every part is easy to clean. Maintenance cost is practically nothing.

### AMERICAN STANDARD WATER RELIEF VALVE

Constructed with iron body and bronze mounting, with our high-grade steel springs and are intended for use on pumps, tanks, pipe lines, etc., where requirements are not as severe as in fire protection service and for which service we recommend our Underwriter type valve.

These valves, however, have unusually large relieving capacity; and if desired both connections can be furnished threaded or flanged at slight additional cost. Regularly furnished set at any desired pressure not exceeding 250 pounds.

Send for Catalog No. 70.



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## AMERICAN STAVE & COOPERAGE CO.

Incorporated

57 Pearl Street  
CHELSEA, MASS.

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### PRODUCTS

#### Wooden Tanks for

Agitating  
Generating  
Mixing  
Separating  
Settling  
Straining  
Storing  
Tumbling

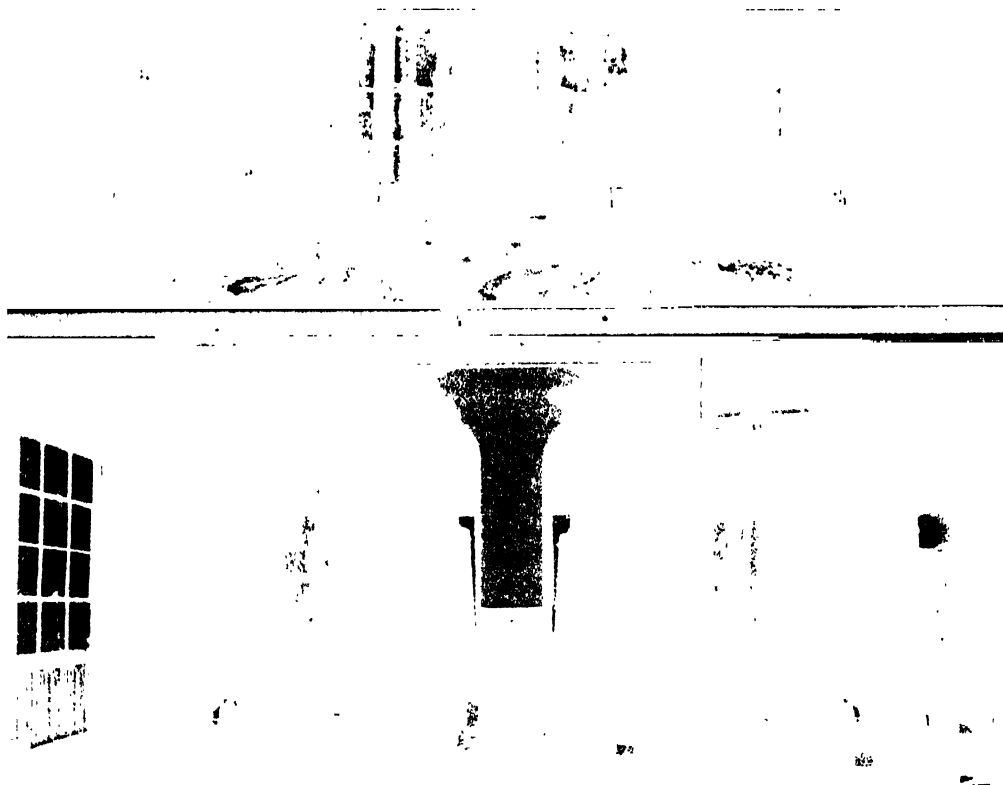
#### Kegs and Barrels for

Liquids  
Semi-liquids

### TANK INSTALLATION

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TYPICAL TANK INSTALLATION MADE BY US



# AMERICAN TRANSFORMER COMPANY

178 Emmet St.  
NEWARK, N. J.



## PRODUCTS

Transformers for Cottrell Electrical Precipitation Systems, Electric Furnace Work, Electrochemical Processes and Laboratory Work, High and Low Voltage Testing, Electric Welding, High Frequency Testing, Ozone Generation, Auto Transformers as Regulators, Radio Operation and Experimentation, Lighting and Power, and Reactances.



Open Iron Core Air Cooled  
Reactance Coil



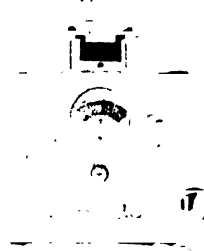
Air Cooled Furnace  
Transformer



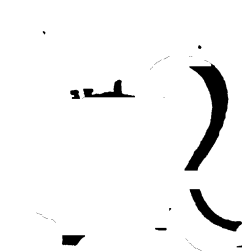
Portable Oil Testing Outfit  
Type TS 6



Water Cooled Fur-  
nace Transformer



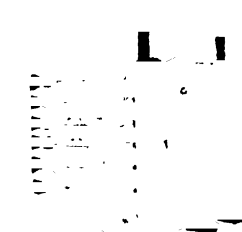
30,000 Volt Testing Set with Reg-  
ulator and Instruments



Laboratory Furnace Transformer



High Frequency, High Voltage  
Testing Set, 200,000 Volts, 200,  
000 Cycles



Portable  $\frac{1}{2}$  KVA Laboratory  
Transformer 1 to 64 Volts in  
1 Volt Steps

## CUSTOM MADE

We specialize in the design and construction of made-to-order transformers, and our experience and manufacturing facilities equip us to fill every requirement in this line.

Engineers connected with the Electrochemical and Metallurgical industries have their own ideas as to the proper applications of alternating current for their purposes. The use of transformers is obviously the most effective method to achieve the best results.

American Transformers are the result of special study of requirements of industrial applications. Their efficiency, operating economy and long life have made them preeminent in their field, a fact attested to by their hundreds of satisfactory installations.

## COOPERATION

Should you need a transformer for special purposes and conditions, beyond the usual commercial types, we will be glad to cooperate with you and help you solve your problems. When writing for estimates, send us complete data covering your requirements.

100,000 Volt Transformer for  
Cottrell System of Precipitation



Heavy Current Oil Cooled  
Transformer



Open Iron Core  
Variable Reactance Coil



50,000 Volt Testing Set



150 KVA Heavy Current  
Air Cooled Transformer

THE ABOVE ILLUSTRATIONS SERVE TO SUGGEST THE GREAT VARIETY OF EQUIPMENT WE ARE PREPARED TO BUILD FOR SPECIFIC CHEMICAL ENGINEERING REQUIREMENTS

# AMERICAN TOOL & MACHINE COMPANY

Trade Mark Registered U. S. Patent Office

Established 1843

Engineers, Founders, Machinists  
BOSTON, 9, MASSACHUSETTS

## PRODUCTS

Weston Centrifugals, 5-inch, Hand Power, and 10-inch, Laboratory, 30-36-40-inch for Sugar, Salt, Chemicals and Drugs with adaptations for every manufacture requiring such process.

Elevators and Carriers for Sugar and Chemicals.

Mixers.

Hydro-Extractors.

Centrifugal Dryers for drying small pieces that have been coated, dipped, japanned, painted, plated, or washed.

Centrifugal Oil-Separators for saving oil from chips and turnings.

Fox Brass Finishers' Lathes.

Belt Knife Leather Splitting Machines.

Fabric Coating Machinery; Spreaders, Doublers.

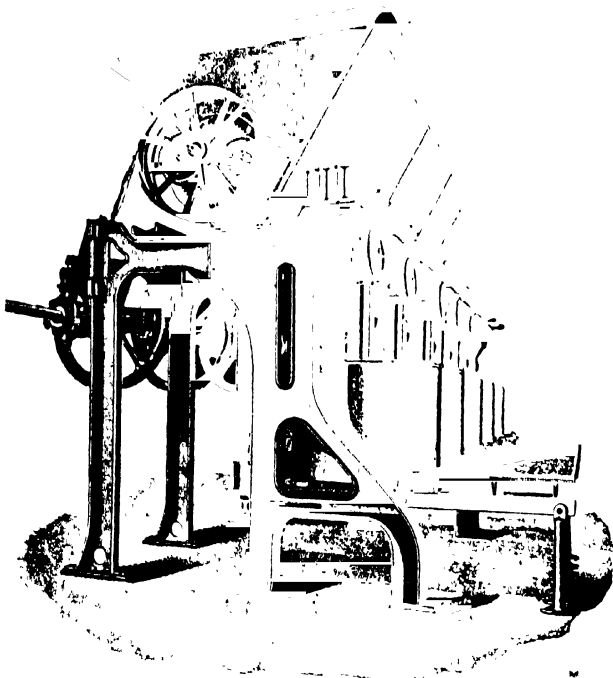
Rubber Cement Churns or Mixers.

Power Transmission Machinery.

Special Catalog of any machine sent on request.

## WESTON CENTRIFUGALS

In 1866 David M. Weston brought his plans for Centrifugal machines to the American Tool & Machine Co. and became intimately associated with them as



**WESTON CENTRIFUGALS IN BATTERY**  
The first power centrifugal was made from designs by David M. Weston in 1851.

the constructive developers of a marvelously serviceable machine.

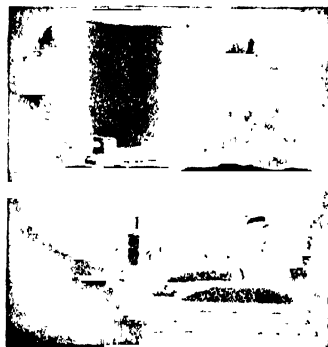
The Weston Sugar centrifugal was first manufactured, and as operated to-day in the 40-inch size, is a machine of vast capacity, delivering a perfect product at a minimum expense. It is driven from the top by water, belting or direct connected motor controlled for all speeds by a single lever and is made in three sizes—30-36-40 inches diameter. The engineering department with the records of more than a half century of success has been of untold service to the sugar manufacturer.

After the sugar centrifugal came the Hydro-Extractor, the Oil-Separator and the 10-inch Laboratory Centrifugal, then the 5-inch Hand Centrifugal. During this period special adaptations of both the top and bottom drive were made without any alteration of the original principles patented by Mr. Weston which are still maintained as standards.

The development of the chemical industry from the first processes on raw material to the finished dyes, pigments, drugs, juices, sugar, nitrates and a multitude of allied products is dependent on the centrifugal. The mechanical principles of the Weston Centrifugal have stood the test through all these years as most simple, reliable and economical in operation and repairs.

## HYDRO-EXTRACTORS

Hydro-Extractors, under-driven for every require-



**WESTON HYDRO-EXTRACTOR**

ment in the manufacture of fibers and woven or knitted goods or garments.

No obstruction in Basket.

Sizes from 20 inches to 54 inches diameter.

*Continued on Next Page*



10-INCH LABORATORY CENTRIFUGAL. BELT OR MOTOR DRIVEN INDISPENSABLE IN THE LABORATORY

### ROPER CENTRIFUGAL OIL SEPARATOR

For removing oil from chips and turnings. The oil is just as good to use again and the chips can be easily handled.



NO. 2

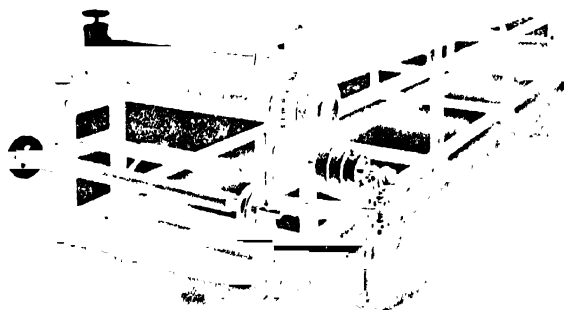
Made in two sizes

No. 1, 525 cubic inches capacity.

No. 2, 2,540 cubic inches capacity.

### FABRIC COATING MACHINES

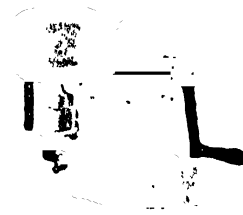
For coating, waterproofing or doubling all textile fabrics.



SPREADER, SINGLE END

### HAND POWER CENTRIFUGALS

5-inch Hand-power Centrifugal for Samples and Quick Tests



HAND POWER CENTRIFUGAL

### CENTRIFUGAL DRYERS

Centrifugal Dryers, with removable basket for drying small pieces that have been coated, dipped, japanned, painted, plated or washed.



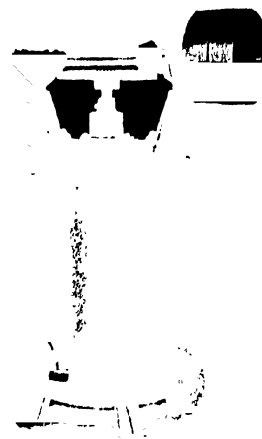
REMOVABLE BASKET



CENTRIFUGAL DRYER

### RUBBER CEMENT CHURNS OR MIXERS

A simple, popular machine of great utility for mixing cements or coatings for fabrics.



RUBBER CEMENT CHURN

Two sizes, 75 gallon and 200 gallon.

# AMERICAN WATER SOFTENER COMPANY

Specialists in all Branches of Water Purification

PHILADELPHIA, PA.

## PRODUCTS

Water Filters, pressure and gravity types  
 Water Softeners, Lime-Soda and Decalso of Pressure and Gravity Types.  
 Water Sterilizing Apparatus.  
 Mechanical Filter Equipment:  
 Chemical feed devices  
 Water and air manifolds  
 Strainers and sand valves  
 Filter sand and gravel  
 Water stills

Controllers  
 Gauges  
 Operating tables  
 Wash troughs

## ENGINEERING SERVICE

The American Water Softener Company is prepared to make scientific investigations of water supplies and to make recommendations for the solution of water purification problems. The company will contract to design and build complete filtration or water softening plants supplying the whole or any portion of the special mechanical equipment.

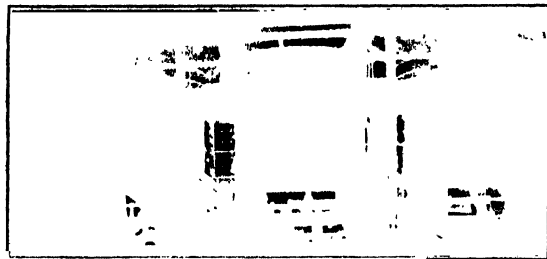
## SCOPE OF USE

Water filters are used for the elimination of dirt, color, odors, bacteria, iron and general waste matters. Softeners are for removal or reduction of hardness, also for neutralizing acid waters and for purifying the water used in sugar refining and many other industrial processes of manufacture.

## DECALSO (Sodium Zeolite) WATER SOFTENER

**Operating Principle** This system operates through a base exchanging process by which the "hardness causing" salts of lime and magnesia are absorbed and are replaced by sodium from the Decalso. When the available sodium is given up Decalso is exhausted and is regenerated or recharged with sodium by washing with a solution of common salt (sodium chloride).

Decalso is a material that is placed in a container or tank and through which the hard water is passed, in the quantity and for the period of time for which the particular plant is designed, until exhaustion. Regeneration is accomplished by breaking up the Decalso bed by means of reversal of current of water or with



"DECALSO" WATER SOFTENING PLANT

Wachmann Silk Dyeing Co., Paterson, N. J.

air or by both in combination, followed by treating with a salt solution and final rinsing with water to remove any excess salt.

In the Decalso process there is no manipulation or adjustment of chemical valves, no sludge or precipitate and no other chemicals to handle than salt. Decalso automatically and naturally compensates for variations in the hardness of the raw water.

**Special Application**—Decalso softeners are particularly suited to manufacturing processes producing materials that precipitate calcium and magnesium; in plants for dyeing, bleaching and finishing of silk, wool and cotton, laundries; tanneries; soap works or wherever soap or saponifying oils are used.

## LIME-SODA WATER SOFTENERS

**Continuous Type**—This type of water softener consists of a settling tank of sufficient size to allow the water a given period of sedimentation between the period of receiving the softening solution and the time of leaving the overflow pipe, an accurate mechanical device, operated automatically by the flow of water, for proportioning a definite amount of softening solution to a given amount of water, a sludge removal system in bottom of settling tank by means of which the sludge or accumulated precipitated impurities are periodically blown out, a filter bed of wood-wool or of sand for removal of any fine precipitate that may fail to settle in the sedimentation process, and such small tanks as are required for the preparation and storage of the softening solution, together with suitable motor for agitating the solution and maintaining a supply, by pumping, at the point where it is proportionally fed to the water.

**Special Application**—For the removal of scale forming mineral matter from boiler feed waters and for softening very hard waters where three to five grains of hardness, per gallon, may be permissible and in combination with Decalso softeners on waters that are too hard to be commercially practicable with the Decalso process alone.



Vertical Horizontal  
PRESSURE FILTERS

Agitator Type  
GRAVITY FILTER

## PRESSURE WATER FILTERS

Made either vertical or horizontal in form, contain properly graded sand and gravel that may be thoroughly washed and cleansed by reverse current of water, with or without air agitation. In this type of filter the water may be pumped directly through into piping system or supplied by tanks, reservoir or stand-pipe.

## GRAVITY WATER FILTERS

Usually round or rectangular and are similar in operation to the pressure type of filter. The washing and cleansing of the sand bed is accomplished by a reverse current of water which is sometimes supplemented with air or mechanical agitation to conserve the use of wash water in breaking up the sand.

## MATERIALS OF CONSTRUCTION

Steel or cast iron is used for the pressure type of Decalso Softeners and Water Filters. Wood, concrete or steel construction, according to existing conditions or purchaser's preference, may be used for the Gravity Filters, and for Gravity Decalso or Lime-Soda Softeners.

# AMERICAN WELDING COMPANY

**ROWLAND FORGE WELDED**

GENERAL OFFICES AND WORKS: CARBONDALE, PA.

## PRODUCTS

Autoclaves, forge-welded, all sizes and pressures.  
One-ton forge-welded containers for shipment of compressed gases.

Forge-welded storage tanks for compressed gases.

Forge-welded digesters for wood-pulp industry.

Forge-welded petroleum stills for cracking processes.

Forge-welded kettles, jacketed or unjacketed, for fusion, reduction, sulphonating, nitrating, evaporating.

Caustic pots, crystallizers and evaporators.

Forge-welded rotary carbonators and drum dryers.

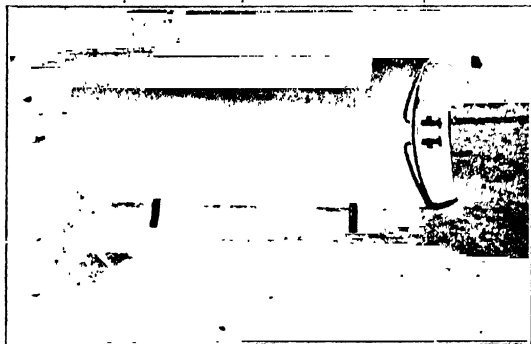
All products of the American Welding Company are forge-lap-welded, presenting a smooth surface on both sides.

## AUTOCLAVES

"Rowland Forge-welded" autoclaves made of fire-box steel plates having ultimate tensile strength not less than 55,000 pounds per square inch combine the maximum of strength with light weight. Cast construction can only assure an adequate degree of safety at the expense of thick walls that seriously impair the heat transmission. Forge-lap-welded autoclaves are superior.

## ROWLAND ONE-TON CONTAINERS

"Rowland Forge-welded" One-ton containers of rolled mill plates and produced under specifications

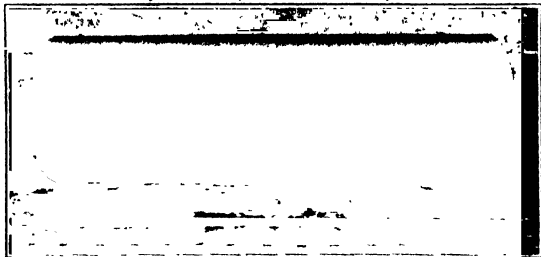


ROWLAND ONE-TON CONTAINER

that conform in all particulars with the regulations of the Interstate Commerce Commission, provide the most resultful and economical means for the transportation and shipment of **Liquid Chlorine, Methyl Chloride and Sulphur Dioxide** for moderate bulk consumers.

## DIGESTERS

"Rowland Forge-welded" digesters for wood-pulp manufacture by the sulphate or soda process are rec-



FORGE-WELDED DIGESTER

ognized by the industry as superior in both design and construction. With all seams forge-lap-welded by the water gas process these digesters exhibit a smooth interior surface without seam or rivet and possess a longer life and greater freedom from leaks than riveted construction. Flanged connections for steam and liquid and manholes are welded in place. Sizes limited only by railroad transportation facilities.

## PETROLEUM STILLS

"Rowland Forge-welded" petroleum stills for high



HIGH PRESSURE FORGE-WELDED STILL, 10 x 30

pressure work and cracking processes increase output through fewer shut-downs and reduce operating and maintenance costs to a minimum by designs and manufacturing methods that are distinctly correct.

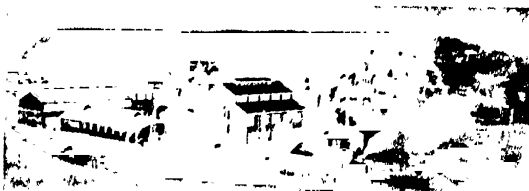
## KETTLES

Kettles of rolled steel plate fabricated by "Rowland" methods are being widely used for a variety of services for fusion, reduction, sulphonating, nitrating, crystallizing and evaporating. All of this product is built entirely from customers' specifications and drawings. Every customer is scrupulously protected as to his exclusive ideas or designs.

## ADVANTAGES

The "don't" in building forge-welded product is as important as the "do" because many welds look alike on the surface. Real values are necessarily concealed until time and use will reveal them.

The most valuable evidence therefore in choice of forge-welded equipment is the opinion formed of such by observing owners. When a reputable manufacturer desires and possesses the esteem of owners, superintendents and foremen, you accept such evidence unquestionably as an infallible guide. Through such performances our 28 years of production of super-forge-welded product has made old friends of new friends.



PLANT OF AMERICAN WELDING COMPANY, VIEW FROM WEST SERVICE

Back of every good product are manufacturing methods that keep it good and insure a healthy growth of the business. You eliminate all guesswork when dealing with a manufacturer that has devoted over a quarter of a century to building a reputation for efficiency and establishing a superior character of service.

# THE AMERICAN WELL WORKS

## Manufacturers of Centrifugal and Deep Well Plunger Pumps

### AURORA, ILLINOIS

FIRST NATIONAL BANK BUILDING, CHICAGO, ILLINOIS  
DISTRICT AND SALES AGENCIES

New York, N. Y.  
(Domestic and Export)  
Philadelphia, Pa.  
Pittsburgh, Pa.  
St. Paul, Minn.

San Francisco, Calif.  
Los Angeles, Calif.  
Artesia, N. M.  
Salt Lake City, Utah  
Denver, Colo.

Kansas City, Mo.  
Joplin, Mo.  
St. Louis, Mo.  
Birmingham, Ala.  
Dallas, Tex.

Montreal, Que., Can.  
Chatham, Ont., Can.  
Calgary, Alta., Can.  
Edmonton, Alta., Can.

### PRODUCTS

Centrifugal Pumps of every description from a small pump with  $\frac{3}{4}$  in. openings and a capacity of 10 gals. per minute to a 60-in. pump with a capacity of 100,000 gals. per minute, for chemical plants, water works, irrigation, drainage, mine, fire protection, quarry, dredge, hydraulic giant, caisson, foundation, sump, trench, bilge, boiler feed, condensing, street flushing and general purpose pumping.

Deep Well Turbine Centrifugal Pumps for pumping wells 12 ins. and larger in diameter and to 250 ft. in depth.

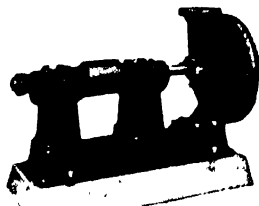
Deep Well Plunger Pumps, Single Acting, Double Acting and 2-stroke.

### "AMERICAN" CENTRIFUGAL PUMPS

These pumps are built in a large number of standard types, and in addition special pumps are designed and built to meet particular conditions especially in chemical plant service.

Centrifugal pumps are made with either open type or enclosed type impellers, with or without diffusers and with either suction or double suction in single stage pumps. All double suction pumps and some single suction pumps are made with split casing, so designed that the cap, or cover, of the casing can be removed to expose internal working parts without disturbing pipe connections.

**Characteristics** — The important features of "American" centrifugals



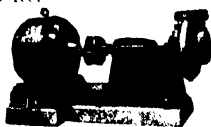
**TYPE ABE ACID PUMP**

Made in small sizes with lead lining and antimony lead composition impeller for pumping certain kinds of acids and chemicals. Chemical pumps are also made of all bronze and special metal composition to meet special requirements.



**TYPE L**

High pressure, single stage, horizontal, belt driven centrifugal pump, of extra heavy construction, for total heads up to 125 feet.



**TYPE PMD**

High pressure, single stage, horizontal centrifugal, with grit proof bearing. Motor driven, for total heads to 200 ft.



**HIGH PRESSURE, 2-STAGE TURBINE CENTRIFUGAL PUMP, WITH MOTOR DRIVE**

are skilful designing so that they attain high efficiencies with flat efficiency curves, thus being economical in use through a wide range of delivery; use of good material in their construction, careful machining and accurate adjustments.

Bearings are ring oiled from oil reservoirs. Impellers are given both rotative and end thrust balance. In single suction, open impeller type pumps, the sides and edges of impeller and interior of casing are carefully machined and closely adjusted at sides to prevent leakage.

Double suction types are fitted with labyrinth rings around suction openings to reduce leakage to a minimum. Multi-stage, enclosed impeller types are designed to have fewest points of leakage back to suction openings.

**Drive** — "American" centrifugal pumps are equipped with plain pulley for belt drive, with grooved sheave for rope drive, steam engine, gasoline engine, electric motor, steam turbine, or with hydraulic turbine.

Pumps are also supplied unmounted with flexible shaft coupling for any power, or mounted on base, but without attached power.

**Catalogs** — Catalogs describing "American" Pumps will be sent on request. No. 149 describes centrifugals; No. 130A, Deep Well Plunger Pumps.



**TYPE DSMD**

High pressure, double suction, single stage, split volute, for total heads to 125 ft.



**TYPE H**

High pressure, 2 stage, vertical shaft, for total heads to 150 ft.



**TYPE IMD**

High pressure, 2 stage, motor driven, for total heads to 250 ft.



**FIG. 1105**

Power head for deep well plunger pump.

---

# THE ANDREWS LEAD COMPANY

Incorporated

Manufacturers of

The Full Line of Blue Lead Products

OFFICE AND FACTORY

LONG ISLAND CITY, N. Y.

---

## PRODUCTS

Chemical Sheet Lead

Antimonial Sheet Lead

Chemical Lead Pipe

Antimonial Lead Pipe

Lead Burning Bars

Lead Wire

Lead Traps and Bend

Lead Tubing

Ribbon Lead

Lead Wool

Block Tin Pipe

Tin Lined Lead Pipe

All products offered for sale by us are manufactured in our own plants.

## ROLLING EQUIPMENT

Our mills are driven by reversing electric motors with full magnetic control and sheet lead produced by us is free from ripples and scale, and is of uniform thickness throughout.

We produce sheets in all widths to nine feet and of any desired thickness or length.

## HYDRAULIC EQUIPMENT

We have the most modern hydraulic presses of various capacities to one thousand tons, with complete stock of dies for special shapes and for lead pipe in all diameters to twelve inches, of any required thickness of wall.

## FACILITIES

We are in position to supply firms making installations of lead equipment, the highest grade chemical sheet lead and other lead products, from a small order to the largest of acid plant requirements.

Deliveries can be had from us promptly.

## GUARANTEE

All "Andrews Lead" Products are guaranteed to be made of new metals of the best grades.

## INQUIRIES

Address all inquiries to

The Andrews Lead Company,

26-36 Greenpoint Ave.,

Long Island City, N. Y.



## ANCHOR POST IRON WORKS

Manufacturers of Wire Fences, Iron Railings  
and Entrance Gates

OFFICE AND SALESROOMS: 50 CHURCH ST., NEW YORK, N. Y.

Telephone: CORTLANDT 4-5678-9

SALES AND ERECTION OFFICES

Boston, Mass. 79 Milk St.

Hartford, Conn. 792 Main St.

Richmond, Va. 117 Mutual Bldg.

Philadelphia, Pa. Real Estate Tr. Bldg.

Minneapolis, Minn. 117 Jericho Turnpike

Cleveland, Ohio, Guardian Bldg.

FACTORIES: GARWOOD, N. J., AND CLEVELAND, OHIO

Stamford, Conn. 11 Clinton Ave.

Rochester, N. Y. 1604 Main St., East

Chicago, Ill. 8-80 Dearborn St.

### PRODUCTS

Anchor Post Chain Link Woven Steel and Mesh Fences and Gates; Woven Wire Fences; Anchor Posts; Picket Railings; Electrically Welded Iron Railings and Gates, for factories, water companies and railroads; Wire Fences and Electrically Welded Sliding and Swinging Gates for country and suburban homes; Wrought Iron and Wire Window Guards; Intertrack Fences.

### ENGINEERING AND ERECTING SERVICE

Anchor Post Iron Works has been called upon, by many industrial corporations and railroads, to design fences to meet a wide variety of conditions. The experience thus acquired is offered for the solution of problems.

At New York, and also at the several branches, is maintained a force of men skilled in putting up our fences and in solving construction problems. When a customer prefers to erect a fence, instructions and necessary tools are furnished.

### INFORMATION REQUIRED FOR ESTIMATES

In writing for prices or ordering, draw a simple diagram showing length of fence lines, location of gates, corners and ends, width of gate openings, single and double. State whether ground is level or graded.

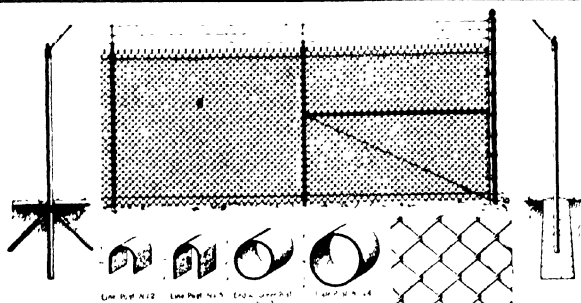
### ANCHOR POSTS

Anchor posts are U-bars of high carbon steel and, together with all other parts, are heavily galvanized above and below ground, preventing rust and insuring long service. Posts are driven into the ground and held rigidly erect by two anchor stakes driven through slots clamped to opposite sides of the posts.

### CHAIN LINK WOVEN STEEL FENCES

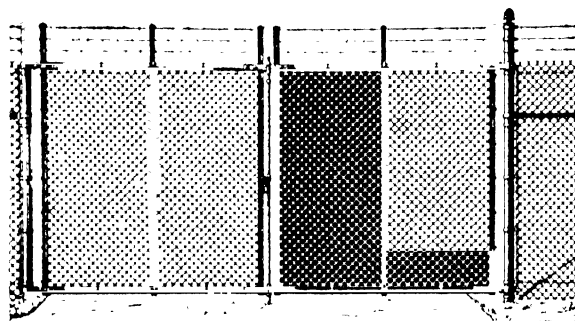
Chain link woven steel is of the best quality galvanized steel wire of No. 9 or No. 6 gage, No. 6 being the size most used. Made in any width up to 10 ft. The mesh is so small it affords no foothold for fence climbers, and as an additional protection three or more strands of barbed wire are fastened to inwardly inclined arms attached to the tops of posts.

Fence is furnished with or without top rail of galvanized pipe. Posts and all fence parts are galvanized by hot dip spelter process. Under conditions where protection is of utmost importance, these fences are made 10 ft. in height, and diagonal arms and barbed wire are attached to both front and back of posts, the spread across the top is about 2 ft. The gates are as unclimbable as the fence.



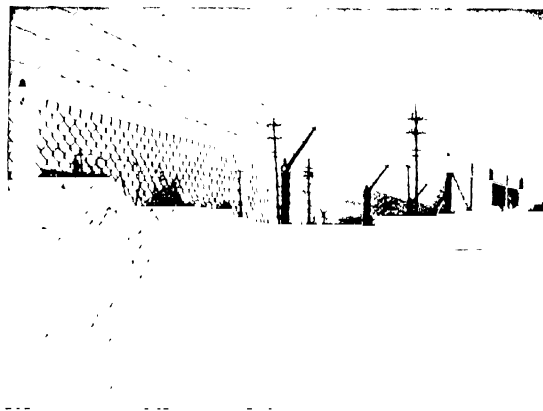
CHAIN LINK WOVEN STEEL FENCE, TYPE DOA-1

Fabric: Chain link woven steel wire No. 6 gage.  
Lath posts: Galvanized Anchor posts, size No. 3, 2 1/2 in. steel U-bar, set 8 ft. on centers.  
End and corner posts: 1 in. steel pipe. Gate posts, 1 in. steel pipe.



ELECTRICALLY WELDED SWINGING GATE, TYPE G

Frames made with electrically welded uprights and corner pieces. Standard gates made to match fence. Single gates, 4 to 10 ft. between gate posts, double gates, 8 to 24 ft. and larger.



ANCHOR POST CHAIN LINK WOVEN STEEL FENCE, TYPE DOA-1  
(Dreadnaught Stockade)

Height	8'0"
Posts	Galvanized Anchor Posts, Size D
Fabric	Chain Link 2" mesh No. 6 wire

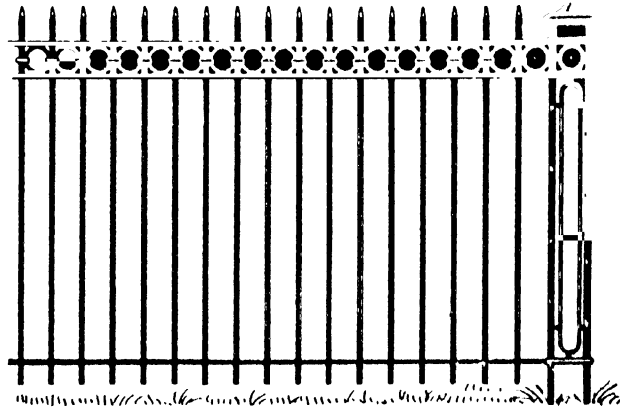
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# **ELECTRICALLY WELDED RAILINGS AND GATES: "ANCHOR-WELD"**

A new and quite revolutionary process in the manufacture of railings and gates has recently been perfected.

**Anchor Post Iron Works** has secured the rights of manufacture, and has installed the necessary electrical machinery for the manufacture of railings and gates of every size and weight, from those made of light iron bars of 1/2-in. square or round, up to the very heaviest forms required for any service. By this process, the rails, pickets or other members are welded together at all points of intersection under a heavy electrical current, combined with a mechanical pressure of from 1 to 5 tons exerted at the moment the weld is made. This insures an absolute and unbreakable union of the metal of both the pickets and the rails.



ANCHOR WELD RAILING

Railings and gates made in this way are remarkably strong and rigid. Each unit, that is, each panel of railing, or each gate, being welded into practically one piece of metal, is free from weak joints or rivets.

Catalog 56 describes this type of railing. A copy will be sent on request.



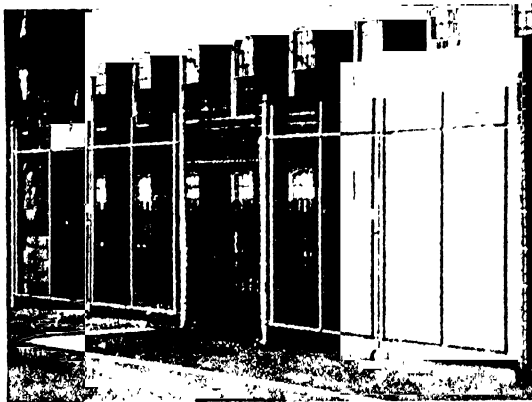
ANCHOR WELD RAILING, TYPE RB3

Including Double Entrance Gates made and erected by us. The railing is 6 ft. in height. 3/4 inch grooved square pickets and rails, set on Galvanized Anchor Posts. The Gate, Type GB11, is 12 ft. wide, hung from Gate Posts. Design No. 200. 1 inches square.



ANCHOR WELD RAILING, TYPE RA3 ELECTRIC WELD GATE 20 FT. WIDE

Twenty four hundred feet of this railing and 8 single and double entrance gates were furnished and erected by us for the Willis Corporation, Elizabeth, N. J. The railing is 6 ft. in height.



DOUBLE CHAIN LINK GATES, TYPE G

Width of opening 14'0"—Height 8'0"

Standard gates are made in height to match fence with the following widths, measuring between gate posts. Single gates, 4 ft. 6 in., 5 ft., 6 ft., 7 ft., 8 ft., 9 ft., and 10 ft. Double gates, 8 ft., 9 ft., 10 ft., 12 ft., 14 ft., 16 ft., 18 ft., 20 ft., 22 ft., 24 ft. and larger to measure.



SQUARE MESH FENCE, TYPE COA-5

Height 7'0"  
Posts Galvanized Anchor Posts Size C.  
Fabric No. 9 Galvanized wire, woven into rectangular mesh.  
Equipped with arms and 3 strands of barbed wire.

# THE V. D. ANDERSON COMPANY

## Oil Mill Machinery and Steam Specialties

CLEVELAND, OHIO

### PRODUCTS

Oil Expellers  
Moisture Expellers  
Crackling Expellers  
Steam Traps  
Air Traps  
Steam Separators  
Oil Separators  
Pressure Oil Filters  
Dryers

### ANDERSON OIL EXPELLERS

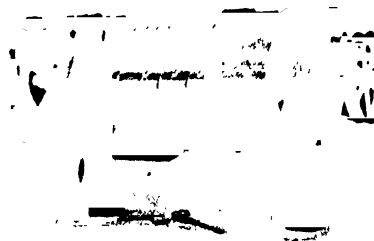
**Operation** The Anderson Oil Expeller is a continuous press, the material being fed into a perforated hardened steel cylinder, in which revolves a shaft carrying a series of hardened steel screws, so arranged as to produce a gradually increasing pressure.

Either a hot or cold pressing of all oil-bearing seeds can be made with the Expeller, and more oil can be obtained than is possible with any other type of press.

**Advantages** - Press cloths are not required in an Expeller mill.

Once the machinery is started, one man can run a plant of six Expellers.

The Expeller may be either belt or motor driven.



ANDERSON OIL EXPELLER

**Uses** The Anderson Oil Expellers are being successfully used to extract oil from:

Almonds,	Palm Kernels,
Castor Beans,	Peanuts,
Cohune Nuts,	Poppy Seed,
Copra,	Rape Seed,
Corn Germs,	Sesame,
Cotton Seed,	Soya Beans,
Flaxseed,	Sunflower Seed,
Mustard Seed,	and other oleaginous
	seeds and nuts

**Capacity** - One Anderson Oil Expeller will handle approximately:

700-800 lbs	per hour - Castor Beans
650 lbs	per hour - Copra (ground)
450-500 lbs	per hour - Corn Germs
450-500 lbs	per hour - Cotton Seed
450-500 lbs	per hour - Flaxseed
500 lbs	per hour - Peanuts
450-500 lbs	per hour - Soya Beans (ground).



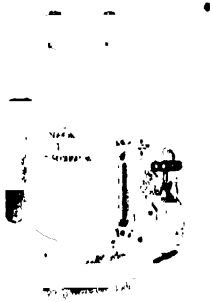
FIVE PRESS EXPELLER MILL  
Can be operated by one man

*Continued on Next Page*

**ANDERSON STEAM AND OIL SEPARATOR**

This separator, being scientifically proportioned and constructed, removes the greatest amount of moisture practicable with a separator.

The cone shaped cap in the head guides the steam with minimum friction through spiral vanes, imparting a centrifugal motion to the steam, and, without reducing the steam pressure, throws the water to the outside of the case where it passes down into the receiving chamber.



ANDERSON STEAM AND OIL SEPARATOR

In addition to its use on steam lines, the Anderson Separator is used with marked success for removing oil, water and gasoline from natural gas mains and for removing water and oil from compressed air lines.

**ANDERSON AIR TRAP**

For removing accumulated air from water under pressure. It is especially adapted for air pockets at high points in street mains, water mains and pipes in large buildings, hot water heating systems and closed-water receivers.



ANDERSON AIR TRAP

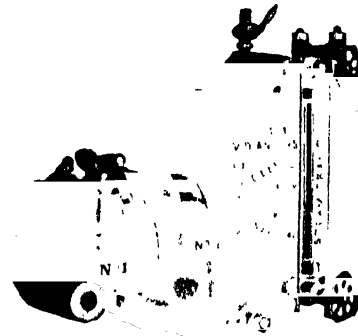
This trap can be placed above or below the ground. It works automatically and requires no attention. It is simple in construction, substantially made, fitted with our seamless copper float and can be provided with a valve to work at any required pressure from 0 to 150 pounds.

**ANDERSON MODEL "D" STEAM TRAP**

This trap works continuously and automatically. The valve and seat are sealed with at least three inches of water at all times, thus eliminating the possibility of live steam escaping with the condensation.

Can be used on any apparatus using steam at pressures varying from 225 pounds to gravity, and also where there is condensation in air lines.

The valve and seat can be quickly changed to accommodate varying pressures without removing the trap from the line.



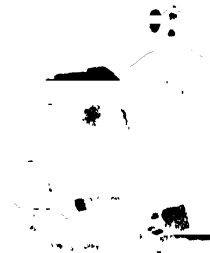
ANDERSON MODEL "D" STEAM TRAP

It only requires a glance at the gauge glass to ascertain whether the trap is working properly.

Each trap is tested and inspected under hydrostatic as well as steam boiler pressure before leaving our factory.

**ANDERSON JUNIOR STEAM TRAP**

This trap meets the demand for a practical trap with a limited capacity at a low price. It has no by-pass or gauge glass, but is made especially for use on sterilizers, paper dryers, radiators or other places requiring small capacity.



ANDERSON JUNIOR STEAM TRAP

Constructed to work at all pressures from 150 pounds down.

**LITERATURE**

Catalogs of our products will be supplied on request.

# THE ANTHONY COMPANY

Liquid Fuel Engineers

138 West Avenue

LONG ISLAND CITY, N. Y.

## PRODUCTS

**Anthony Nebulyte Oil Burners, Gas Burners, Combination Oil and Gas Burners, Torches.**

**Anthony Nebulyte Oil and Gas Burning Equipment for all industrial heating processes.**

**Anthony Nebulyte Oil Sprays for Gas Plants and Sprays for all liquids.**

**Anthony Forges and Heat Treating Furnaces.**

## ENGINEERING SERVICE

The **Anthony Company** is prepared to design new equipment and redesign old equipment of any kind enabling anyone to avail himself of the advantages of oil or gas fuel, or both in combination.

The Engineering staff is also prepared to discuss all heating problems and design special oil or gas fired apparatus for specific needs.

Having designed a great variety of successful industrial heat treating systems, Anthony engineers have wide experience in this field to place at a client's disposal.

They are pioneers in the development of mechanical nebulization as applied to the combustion of liquid fuel, as well as in the application of those combustion principles which affect the accurate control of heat quality.



**THE ANTHONY NEBULYTE SPRAY**  
Note the Mist of Liquid

Employment of their services leads to conservation of fuel, speeding up of production, and better quality of output.

## ANTHONY NEBULYTE BURNERS AND TORCHES

These devices are applicable wherever forges, furnaces, stills, dryers, boilers, kilns or other apparatus require heat. Low and high pressure designs to suit every requirement. A trial quickly proves their unequalled operating characteristics.

## ANTHONY FUEL EQUIPMENT

The continuous and successful operation of any fuel system depends upon the use of correct equipment, installed and adjusted in accordance with established facts. Special equipment of approved type for every part of liquid and gas fuel systems supplied.

## ANTHONY NEBULYTE SPRAYS FOR GAS PLANTS

In the operation of Gas Plants, **Nebulyte Sprays** give perfect nebulization, positive control and uniform distribution of oil. No steam or compressed air required.

## ANTHONY NEBULYTE SPRAYS FOR ALL PURPOSES

Sprays supplied of definite capacity and throw which can be utilized for many purposes, such as: cooling, aerating, atomizing, gasifying, mixing, absorbing gases and vapors, and for all purposes where it is desired to distribute a liquid in finely divided form over a large area, or thru a large volume.

## ANTHONY FORGES AND HEAT TREATING FURNACES

These include rivet forges, crucible furnaces and a general line of heat treating furnaces built to take advantage of the superior operating characteristics of **Nebulyte Burners**. Simple, compact, sturdy, non-oxidizing. Low operating cost. Portable and stationary.

# AQUA ELECTRIC HEATER COMPANY

250 WEST 54TH STREET, NEW YORK, N. Y.

FACTORY, BRIDGEPORT, CONN

## PRODUCT

The "Aqua" Instantaneous Electric Water Heater.

## CONSTRUCTION

The Characteristic feature of this device is comprised of a cylindrical body of porcelain in which are 22 tubular passages, from top to bottom. These passages are connected progressively to each other by porcelain caps, so that the 22 passages become one continuous passage.

The water to be heated enters into the passage, from the house piping, and continues in circuit through the 22 passages, from the last of which it is led to the discharge faucet.

The passages are all provided with non-corrosive coils distributed through in circuit, and the terminals of this heating element are connected by means of a snap switch to the source of current supply; therefore, when the water flows through the porcelain passages it passes directly over the heating element.



AQUA HEATER INSTALLED

## CONSUMPTION

Basing the cost on running the heater by the hour at a consumption of 6.6 k.w. per hour assuming the natural water to be about 65 degrees:

Temperature	Water Obtained per Hour	Cost per K. W. Hour	Total Cost per Hour
110°	240 quarts	2c	13c
132°	160 "	3c	20c
195°	80 "	4c	26c
205°	76 "	5c	33c

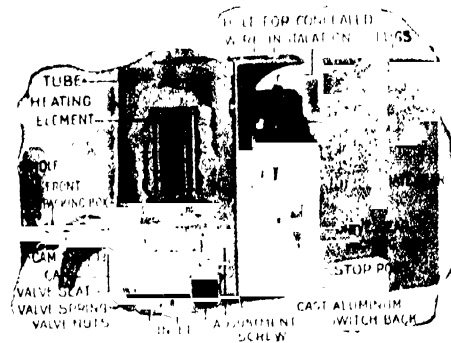
The electric current is only consumed when hot water is drawn.

## EFFICIENCY

This device is approved by underwriters, universities, and engineers, and will give service indefinitely after once properly installed. There are no small springs or delicate parts. Every piece is made in our own factory of the finest material obtainable, consisting of bronze, brass, copper, porcelain, and insulation. Comparing the water output with its electric consumption, it produces 99 per cent efficiency.

## FEATURES

Clean, sanitary, and sterilized hot water, boiling hot if you desire, instantaneously, then natural cold water through the same faucet. Our double valve faucet does not allow the cold water to pass over the red hot resistance element. Every part accessible. The same device will operate on either alternating or direct current.



CROSS SECTION SHOWING MECHANICAL FEATURES

## INSTALLATION

Remove the ordinary faucet and mount the Aqua. It is equipped to take standard 1/2 inch pipe. The name plate designates the voltage and amperage, which is all that is necessary to ascertain the proper size wire to be used for connecting direct from the meter to our device.

## MODELS

The two prominent voltages in existence all over the world are our standard models,

110 Volt	.....	60 Amp
220 Volt	.....	30 Amp.

This device is applicable to either A. C. or D. C. Current.

We can supply any voltage desired. When ordering specify voltage.

## WEIGHTS

Each heater is boxed individually. A standard crate contains 5 heaters.

Each heater weighs net	.....	16 lbs.
Boxed (gross) weighs	.....	25 lbs.
Consuming 1/2 cu. ft.		
Standard crate weighs net	.....	80 lbs.
Gross, 125 lbs.		2 1/2 cu. ft.

# THE ARCTIC ICE MACHINE COMPANY

Manufacturers of Ice Making and Refrigerating Machinery

MAIN OFFICE AND WORKS, 916 S. MARKET ST., CANTON, OHIO

New York, 50 Church St.

New Orleans, 851 Carondelet St.

## PRODUCTS:

### ICE MAKING AND REFRIGERATING PLANTS

— in any size, from one ton upwards.

**HEAT EXCHANGERS**, in all styles--atmospheric, double pipe, submerged, shell and tube.

**LARGE WATER COOLING SYSTEMS**—where the temperature is brought down lower than it can be done by cooling towers, or spray ponds.

**CHEMICAL PRECIPITATING PLANTS**—where certain soluble chemicals are precipitated into solids at low temperatures.

**ROLL COOLING SYSTEMS**—for the rubber industry--we have done more of this work than any other firm.

**SOLUTION AND GAS COOLERS**—in styles best adapted to the particular use.

**CHEMICAL RECLAMATION PLANTS** for reclaiming benzol and other volatile liquids in gaseous form for reuse.

**GAS CONDENSERS** atmospheric, double pipe, submerged and tube types.

**OIL COOLING SYSTEMS** for use in connection with large steel heat treating plants or any other purpose.

**COLD DRINKING WATER PLANTS** for large industrial institutions.

**PIPE WORK AND FITTINGS**—for every use and pressure. Our drop forged steel line of fittings for high pressure work.

**INSULATING MATERIAL**—for every condition.

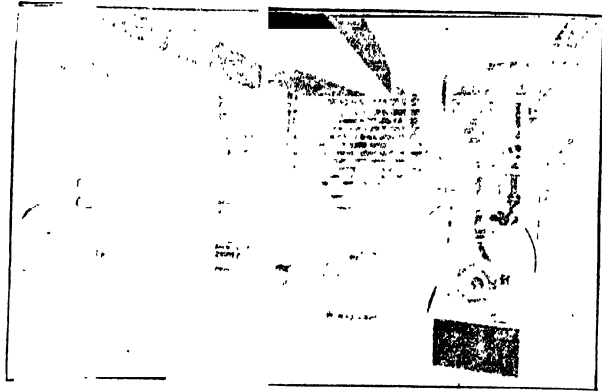
## CO-OPERATIVE SERVICE:

We specialize in adapting refrigeration to Industrial requirements. The experience of our organization is at your command. If you are in doubt as to your needs, we will investigate and guarantee results.

We can advise you as to the most efficient method of removing heat or transferring it from one substance to another.

Our machinery is suitable for connection to any kind of power.

The illustration to the right shows our larger type of Horizontal Compressor, built in sizes from ten to three hundred tons daily refrigerating capacity.



SMALL ARCTIC PLANT FROM 1 TO 23 TONS CAPACITY

These small units can be operated by direct connected steam engine or belted to either steam, gas engine, or motor.



DOUBLE PIPE RETURN BEND



ARCTIC HORIZONTAL COMPRESSOR

# ARMSTRONG CORK & INSULATION COMPANY

133 Twenty-fourth Street

PITTSBURGH, PA.

BRANCHES IN THE PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

## PRODUCTS

**Nonpareil Cork Covering** for the insulation of Brine, Ammonia, Drinking Water and other Cold Lines, Tanks, Coolers, etc.

**Nonpareil High Pressure Blocks, Cement and Covering** for the insulation of High Pressure and Superheated Steam Lines, Stills, Tanks, Evaporators, Vacuum Pans, Enameling and Japanning Ovens, etc.

**Nonpareil Insulating Brick** for the insulation of Industrial Furnaces, Ovens, Kilns, Regenerators, Boiler Settings, etc. **Nonpareil Insulating Cement.**

**Nonpareil Corkboard** for the insulation of all kinds of Cold Storage and Constant Temperature Rooms in Factories and Laboratories.

## NONPAREIL CORK COVERING

Nonpareil Cork Covering is the most efficient, durable and economical insulation obtainable for brine, ammonia and ice water lines and for cold pipes and tanks generally. Its efficiency is due, in a large measure, to the peculiar characteristics of its sole ingredient, cork.

**Structural Features**—Clean, granulated cork is compressed and baked in molds formed to fit pipes of different sizes and the fittings generally used. No foreign binder is needed, as the natural gum in the cork, liquefied by heat, cements the particles firmly together. Moreover, this gum covers each granule with a shellac-like film which renders it practically impervious to moisture. The covering is then coated, inside and out, with a waterproof mineral rubber finish, ironed on. As a result, Nonpareil Cork Covering is protected, internally and externally, against deterioration due to moisture absorption and the penetration of frost. When properly applied, the joints sealed with Nonpareil Waterproof Cement, Nonpareil Cork Covering will last for years—longer than the pipe, in many recorded instances.

**Insulating Efficiency**—The insulating efficiency of Nonpareil Cork Covering is due to the high percentage of "dead" air contained in the myriads of sealed cells that make up the structure of natural cork. This



Oil storage tanks insulated with Nonpareil Cork Lagging. Oudahy Refining Company, Coffeyville, Kansas.

cellular construction so effectively retards the transmission of heat that Nonpareil Cork Covering saves approximately 80% of the refrigeration which would be lost from bare pipe.

**Forms and Sizes** Nonpareil Cork Covering is supplied in molded covers for practically all fittings, screwed and flanged, and in split sections, 36 inches long, for straight runs of pipe. It is made in three thicknesses—Standard Brine Covering for lines carrying refrigerant between 0° and 25° F.; Special Thick Brine Covering for temperatures below 0° F.; and Ice Water Covering for refrigerated drinking water lines and others where temperatures are above 25° F. All sundries necessary for application are supplied with the covering.

Nonpareil Cork Covering is also furnished in the form of lagging, beveled to any desired radius, and in thicknesses up to 6 inches, for the insulation of tanks and other cylindrical cold surface.

A 64-page book, "Nonpareil Cork Covering," contains complete detailed information and specifications invaluable wherever refrigeration is used. A copy of this book and a sample of the covering will be sent free on request.

## DRINKING WATER SYSTEMS

One of the special applications of Nonpareil Cork Covering is for the insulation of refrigerated drinking water systems in industrial plants. This system of distributing drinking water has, in recent years, become firmly established not only as a convenience but as an economic necessity. It delivers properly cooled water in the quantity required, when and where needed; it occupies little space, saves time and money and is clean and sanitary.

Nonpareil Cork Covering in Ice Water Thickness is especially adapted for the insulation of the distributing lines and apparatus. It is neat in appearance, vermin- and moisture-proof and fire retardant. Its high insulating efficiency insures a minimum of refrigeration and power and its durability is a guarantee of long life in service.



Nonpareil Cork Covering and Lagging on brine lines and fittings in the plant of the Loose-Wiles Biscuit Company, New York City.

*Continued on Next Page*

Engineering data not available elsewhere are contained in the 48-page book, "Drinking Water Systems," which will be sent on request and without charge. The information regarding water, power and refrigeration required, data on installing the system, approximate operating costs, etc., will be found of unusual value and assistance.

#### NONPAREIL HIGH PRESSURE BLOCKS, CEMENT AND PIPE COVERING

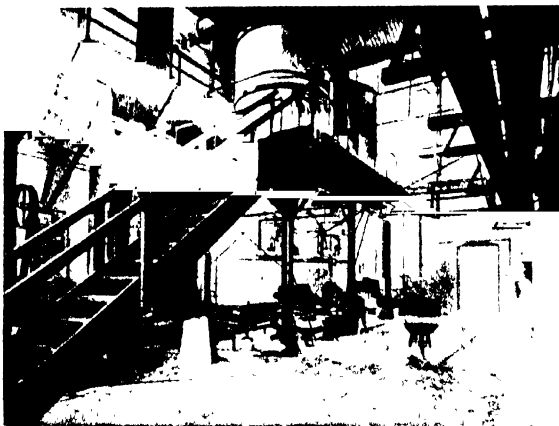
Nonpareil High Pressure Blocks are composed principally of diatomaceous earth and asbestos fiber, their unexcelled efficiency and durability being largely due to the structural characteristics of the former material. Diatomaceous earth is practically pure silica in cellu-



Feed water heater insulated with Nonpareil High Pressure Blocks and Cement. Minneapolis General Electric Company, Minneapolis, Minn.

lar form, the shells or skeletons of microscopic plants (diatoms) that grew in the sea ages ago.

**Insulating Efficiency**—There are something like 39 billion of these hollow shells to the cubic inch. Hence, the material contains a large amount of entrapped or "dead" air which accounts for its remarkable ability to retard the transmission of heat. Because of this peculiar quality of diatomaceous earth, Nonpareil Blocks contain a much higher percentage of "dead" air than other materials which depend for their efficiency on the air entangled among their solid crystals and fibers. Carefully conducted tests show about 12% greater efficiency for Nonpareil Blocks.



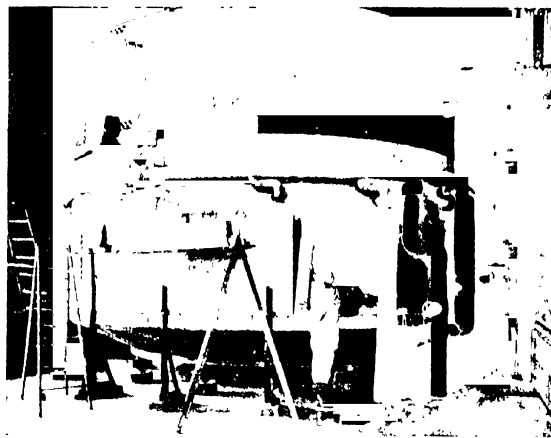
Double effect evaporators in the plant of the Warner-Kleipstein Chemical Company, South Charleston, W. Va., insulated with Nonpareil High Pressure Blocks and Cement.

**Other Advantages**—Nonpareil High Pressure Blocks will withstand relatively high temperatures without calcining or disintegrating. Hence, they are especially adapted for the insulation of evaporators, feed water heaters, vulcanizers, driers, tanks, breechings, kettles, enameling and japanning ovens and other heated equipment. Nonpareil Blocks have been subjected to a practically continuous temperature of 1000° F. for over a year without showing any deterioration.

Furthermore, since all ingredients are insoluble in water, Nonpareil Blocks will stand repeated wetting, and even submersion, without change of form or loss of structural strength. This quality is of particular importance in the case of equipment in chemical and industrial plants where steam and water are in contact with the insulation.

Because of these unusual qualities, Nonpareil High Pressure Blocks and Cement effect very important economies in the operation of many kinds of equipment by conserving heat and increasing the efficiency to such an extent as to bring about a marked decrease in operating cost. By keeping down workroom temperature, they also aid materially in improving shop conditions.

**Structural Details**—Nonpareil Blocks are made in 3, 6 and 12 inch widths, 18 and 36 inch lengths and in 8 thicknesses from 1 to 4 inches, inclusive. They are light and easy to handle and can be quickly and inexpensively applied on practically any type of equipment.



Applying Nonpareil High Pressure Blocks to a tank in the plant of the Stroh Products Company, Detroit, Mich. A coat of Nonpareil High Pressure Cement was afterward applied.

Nonpareil High Pressure Cement and Nonpareil A-1 Cement are practically the same material in loose form for plastic application on fittings and irregular surfaces and as a finish coat over the blocks. They trowel to a fairly smooth surface. Nonpareil Finishing Cement is for finishing purposes only, where an especially smooth and hard surface is required.

#### NONPAREIL HIGH PRESSURE COVERING

Nonpareil High Pressure Covering for steam pipes is of the same composition as Nonpareil Blocks, molded in sectional form for pipes of all sizes. Its superior insulating efficiency, and the ability to resist moisture and high temperatures especially qualify it for use on high pressure and superheated steam lines, or under

*Continued on Next Page*



the unusually severe moisture and humidity conditions encountered in many industries, and for underground heating and power lines. Nonpareil High Pressure Covering is furnished in 36-inch sections, canvassed and banded, and in all standard thicknesses.

**Literature and Samples**—The illustrated books, "Nonpareil High Pressure Blocks and Cement," "Nonpareil High Pressure Covering," together with liberal samples, will be furnished, without charge, on request.

### NONPAREIL INSULATING BRICK

Nonpareil Insulating Brick combine high insulating efficiency with structural strength and heat resistance in a form readily adaptable to the insulation of furnaces, ovens, kilns, boiler settings and drums, lehrs, benches, stills, retorts and similar apparatus.

Nonpareil Brick are composed principally of diatomaceous earth mixed with a small amount of granulated cork. In the process of manufacture, the cork is burned out, leaving additional air spaces which further enhance the insulating efficiency of the finished product.

**Insulating Value**—Nonpareil Brick have fully ten times the heat retarding capacity of common or fire brick; in other words, a 4½ inch course is equal in insulating efficiency to 45 inches of ordinary brick. Their use results in a saving of from 60% to 75% of the heat lost by conduction and radiation from uninsulated construction. Since radiation loss frequently amounts to 20% or 25% of the total heat, it is clear that the saving effected represents a very important economy in the use of fuel. In fact, carefully checked operating records have shown actual fuel savings of 10% to 15%, and more, where Nonpareil Brick have been used in the construction.

**Other Advantages**—Though fuel economy alone is more than sufficient to justify the use of Nonpareil Brick, other results are equally valuable. Less time is required to reach working temperatures. Overheating in the combustion chamber is eliminated, thereby prolonging the life of the refractories. More constant

the saving in the cost of which largely offsets the cost of insulation. Though averaging in weight only about 16 pounds each, Nonpareil Brick have a crushing strength of 10 tons per square foot, and are therefore capable of carrying the weight and withstanding the strains encountered in high temperature equipment.

Nonpareil Brick are not a refractory. They will, however, endure a direct heat of 1650° F. without



Showing how Nonpareil Insulating Brick are installed in a boiler setting between the courses of fire brick and common brick.

change of form or quality, which, when properly installed, is ample for practically all conditions.

The advantages of solid insulation construction over the old-time practise of leaving spaces between double walls, or packing with loose fillers are obvious. Nonpareil Insulating Brick cannot settle or pack. They are built in as rigid, permanent construction, an integral part of the equipment.

**Further Information**—The unusual merits of Nonpareil Insulating Brick and their many industrial applications are fully described in a new illustrated publication of 72 pages, "Nonpareil Insulating Brick," which will be sent free on request. Many classes of equipment are treated separately and specifically, with operation records, detailed reports of tests and full specifications. The information given in this book is of exceptional value to designers and operators of industrial plants using high temperature equipment.

### NONPAREIL CORKBOARD

Nonpareil Corkboard is generally recognized as the standard insulation for cold storage and constant temperature rooms of all kinds. It is made of clean, granulated cork, compressed in molds and baked in sheets 12 x 36 inches and in various thicknesses from 1 to 6 inches inclusive. Special thicknesses can also be furnished.

### NONPAREIL MACHINERY ISOLATION

Nonpareil Machinery Isolation for the reduction of noise and vibration from moving machines is similar in composition and form to Nonpareil Corkboard except that it is much more densely compressed. Placed under the bases of fans, motors, drills, presses, rolls and other machinery, it deadens sound and absorbs vibrations.

Samples and literature descriptive of Nonpareil Corkboard and Nonpareil Machinery Isolation will be furnished on request.



Insulating the drum of an oil still with Nonpareil Insulating Brick.

and evenly distributed furnace temperatures assure uniformity of product. The retention of heat inside the equipment means its exclusion from the workrooms with a consequent improvement in working conditions that tends to increase morale and efficiency.

**Structural Features**—Being supplied in standard fire brick shapes and sizes, Nonpareil Brick are easily bonded with the fire brick or common brick. Their use involves no additional construction as they take the place of at least an equal number of other brick,

# THE ASHTON VALVE COMPANY

## Safety and Relief Valves, Pressure and Vacuum Gages

NEW YORK, N. Y.  
126 Liberty Street

161 First Street, Cambridge 41  
BOSTON, MASS.

CHICAGO, ILL.  
318 West Washington Street

### PRODUCTS

Pop Safety Valves	Ammonia Gages
Relief Valves	Pyrometer Steam Gages
Ammonia Relief Valves	Altitude Gages
Ammonia Diffuser	Chemical Pressure Gages
Hydraulic Relief Valves	Alarm Gages
Pressure and Vacuum Gages	Recording Pressure Gages
	Whistles
	Compound Gages

### ASHTON SAFETY VALVES AND GAGES

For over 50 years the Ashton Valve Company has been engaged in the manufacture of valves and gages, with the result that the Ashton product is now generally recognized as of absolutely dependable quality. In industrial service, Ashton products have abundantly demonstrated that they possess the efficiency and durability demanded by modern advances in steam and chemical engineering—high pressure, high superheat, etc.

The value of Ashton pressure and vacuum gages for scientific work demanding the utmost accuracy is testified to by the fact that many of the leading manufacturers of testing appliances specify Ashton gages as their standard.

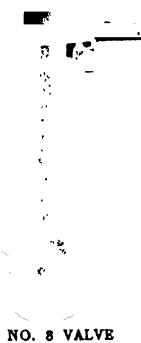
Our large modern factory, fully equipped with special tools, is conveniently located for making prompt delivery to railway and steamship lines. One of the greatest factors contributing to the success of our products is the genuine cooperation of skilled workmen, many of whom have grown up with the business and who take real pride in seeing that the various intricate and exacting processes necessary to produce an efficient safety valve or an accurate and reliable gage, are properly executed.

We realize the exacting demands of the chemical industries, and feel confident of the ability of Ashton products to meet such. We particularly desire to do business with those who discriminate for quality and ultimate reliability in preference to first cost.

### APPLICATION OF ASHTON PRODUCTS IN THE CHEMICAL INDUSTRIES

Some of the uses of Ashton Safety Valves and Gages to the chemical industries are mentioned in the following:

As a protection against excessive pressure on low pressure lines between the reducing valves and the stills, jacketed kettles, evaporators, digestors, cookers, dryers, etc.



NO. 8 VALVE

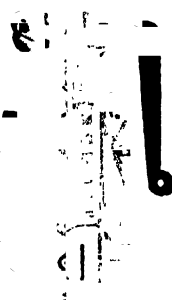


NO. 24 VALVE

For such purposes the No. 8 steam valve with open discharge, trip lever and lock-up, or similar No. 9 style valve having pipe outlet are adaptable, while for water relief the No. 24 style is most suitable.

For large power plant boilers the No. 20 style pop safety valve will be found to give the most efficient and dependable results. For use on autoclaves, small pressure tanks, boilers, stills, or cookers the Ashton No. 31 style safety valve with open outlet, or the No. 32 with pipe outlet are recommended and made in various sizes from 1/8" to 3 1/4".

The Ashton No. 23 ammonia relief valves are unsurpassed for ammonia compressor service with which diffusers are also furnished when so desired.



NO. 20 VALVE

### ASHTON PRESSURE AND VACUUM GAGES

These gages are made in various styles, both registering and recording, to meet any requirements on steam, water, gas or air installations.

The No. 51 style steam gage, No. 53 vacuum, No. 55 hydraulic, No. 57 ammonia, No. 60 altitude, No. 61 chemical and No. 73 recording, are each specially adapted for their particular kind of service. The Ashton ammonia gage is made with all parts of iron or steel. The Ashton chemical gage is suitable for use where corrosive liquids or chemicals are used.

The No. 60 altitude gage indicates both the actual and required water level in tanks, stand pipes or reservoirs. The dial is graduated in feet of water column, and the extra lazy hand in red is adjustable to show the water level that should be maintained. The No. 60A water tank indicator gage is a special design to indicate tank levels only.

Complete catalog No. 18 furnished upon request.



NO. 60 GAGE

# THE ASSOCIATED TILE MANUFACTURERS

Wall and Floor Tiles, Ceramic Mosaic, Faience  
BEAVER FALLS, PENNSYLVANIA

## MEMBER FACTORIES

Alhambra Tile Co  
Newport, Ky  
American Encaustic Tiling  
Co., Ltd.  
Zanesville, Ohio  
Beaver Falls Art Tile Co  
Beaver Falls, Pa.

Cambridge Tile Mfg. Co.  
Covington, Ky.  
Grueby Faience & Tile Co.  
Perth Amboy, N. J.  
Matawan Tile Co.  
Matawan, N. J.

Mosaic Tile Co.  
Zanesville, Ohio

National Tile Co.  
Anderson, Ind.

Old Bridge F. B. & Tile Co.  
Old Bridge, N. J.

Perth Amboy Tile Works  
Perth Amboy, N. J.  
C. Pardee Works  
Perth Amboy, N. J.  
U. S. Encaustic Tile Works  
Indianapolis, Ind.  
Wheeling Tile Co.  
Wheeling, W. Va.

## PRODUCTS

Vitreous, semivitreous, ceramic, mosaic, glazed, enameled, faience and trim tile of every kind and for every purpose. Unglazed, or bright, dull and matt glazed in all colors. Plain or decorative.

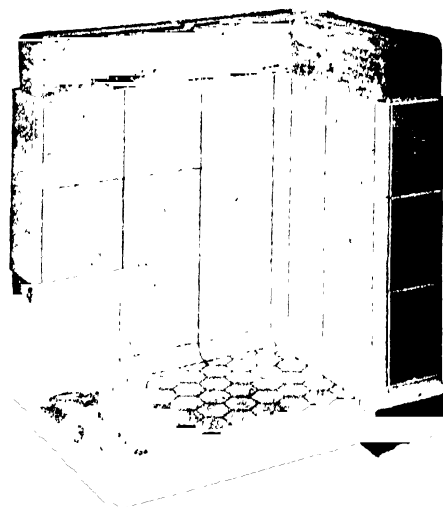
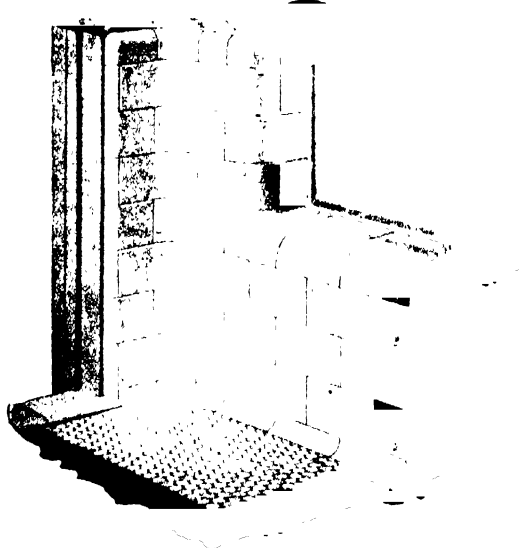
## ADVANTAGES

Non-porous; non-absorbent, proof against acid and alkaline reaction, serviceable for low or high temperature conditions; oil-proof, easily cleaned.

## USES

Suitable for the lining of chemical hoods, mixing and acid tanks, vats, agitators, stuff chests, reservoirs and similar containers requiring a non-porous, impermeable and easily cleaned lining material.

Recommended for floors, walls, wainscots, ceilings, columns, in laboratories, workrooms; engine rooms; stairways, ramps; first-aid stations; sick-wards; toilets; wash-up rooms, showers; swimming pools, cafeterias, dining rooms, etc.



FLOOR AND WALL SECTIONS SHOWING DIFFERENT STYLES OF WHITE TILING AND SANITARY FEATURES

An almost endless variety of styles can be produced with our tiles

sanitary; attractive; permanent; light-reflecting glazes and colors.

By the use of the proper tiles in workrooms of factories the efficacy of lighting can be increased considerably and maintained at a minimum cost for cleaning. Neither the color nor the brightness of the glazes deteriorates with age or is affected by fumes or atmospheric corrosives.

Our tiles are extensively and successfully used for floors, walls and ceilings in dairies, creameries, food factories, laundries, bottling and refrigerating plants, packing houses and factory buildings of almost any kind where cleanliness, permanence and economy in maintenance are wanted.

## COOPERATIVE SERVICE

Upon request, our Service Department will make a special study of requirements and conditions where necessary to submit proper recommendations, cooperate in selecting and specifying tiles best suited for any given purpose, and suggest special setting methods and means for special work. Information on the best practice and assistance in the solution of any problem involving tile work can always be obtained through this department.

Information on acid resisting cements used in connection with our tiles furnished upon application. Samples of tiles for tests cheerfully sent upon request. Please state intended use and conditions so that correct tiles can be sent at once.

Correspondence invited.

# ATERITE COMPANY, INC.

Acid Resistant and High Temperature High Pressure Alloys  
N.E. CORNER JOHN & WILLIAM STS., NEW YORK, N. Y.

BRANCH OFFICES  
Conway Building, Chicago, Ill.

Beatty Building Houston, Tex.

WORKS  
Paterson, N. J.

## PRODUCTS

We are prepared to furnish special alloys of Acid Resisting Qualities and for High Temperature, High Pressure Service Conditions.

## "ATERITE"

Aterite is a patented non-corrosive metallic alloy for acid and high temperature, high pressure lines.

### Forms of Manufacture—

Bolts, Nuts and Washers  
Chains  
Cocks  
Coils  
Gauges  
Pipe Fittings of all types  
Pipe, Wrought and Cast  
Rods  
Screens  
Sheets  
Special Castings  
Valves of all types  
Wire

### Properties—

	Cast	Wrought
Fusing Temperature	2,780° F.	2,480° F.
Weight	5.36 lb. cu. ft.	5.43 lb. cu. ft.
Ultimate Tensile Strength	86,800 lb. sq. in.	163,200 lb. sq. in.*
Elastic Limit	78,460 lb. sq. in.	163,200 lb. sq. in.*
Elongation in 2 in.	24.6%	1.6%
Reduction in Area	31.5%	17%

\* 12 numbers hard

### Recommended For—

#### Acids—

Arsenious	Lactic
Boric	Oleic
Carbolic	Phosphoric
Citric	Pyrogallie
Formic	Salicylic
Hydrofluoric	Sulphurous
Hydrofluosilicic	Tannic
	Tartaric

Sulphuric—Cold—of any degree Baumé including Fuming.

—Hot—up to 60° Baumé any temperature up to 150° F.

—Hot—60° to 66° Baumé any temperature up to 225° F.

#### Bases—

Calcium Hydrate	Caustic Soda
	Caustic Potash

## Salts—

Aluminum Chloride	Calcium Citrate
Aluminum Sulphate	Calcium Sulphate
Ammonium Bromide	Copper Sulphate
Ammonium Citrate	Lead Acetate
Ammonium Oxalate	Nickel Sulphate
Ammonium Phosphate	Sodium Citrate
Ammonium Sulphate	Sodium Formate
Barium Chloride	Sodium Hypochlorite
Calcium Chloride	Sodium Phosphate

## Organic Compounds—

Acetone	Ether
Benzol	Formaldehyde
Carbon Tetrachloride	Glycerine
Chloroform	Phenol
Collodion	

## Mixtures—

Mine Water	Tannic and Sulphuric Acids
------------	----------------------------

## Colors—

Nearly all colors and derivatives made from coal tar products and many others.

## "FANOSITE"

Fanosite is a patented aluminum alloy proof against corrosive action of acids

### Forms of Manufacture—

Cast Bolts and Nuts  
Cocks  
Coils  
Gauges  
Pipe Fittings of all types  
Pipe, Wrought and Cast  
Special Castings  
Valves of all types

### Properties—

Weight	203 lb. per cu. ft.
Ultimate Tensile Strength	22,923 lb. per sq. in.
Elongation in 2 in.	6.25%

### Recommended For—

Acetic Acid, any strength or temperature  
Nitric Acid, cold  
Edible Gelatin

## PUBLICATIONS

Bulletin No. 6. Addressed to the oil industry, but containing complete information on "Aterite" for acid and high temperature, high pressure work; also articles of manufacture, in all "Aterite," in iron body "Aterite" trimmed, and in semi-steel "Aterite" trimmed.

Bulletin No. 7. Covers the subject of "Aterite" in the wrought form only.

*Continued on Next Page*

O S & Y GATE VALVE

SCREWED-IN BONNET GATE VALVE

GLOBE PLUG NEEDLE VALVE

GLOBE VALVE

SWING CHECK VALVE

QUICK OPENING  
GATE VALVE

EXPANSION JOINT

BOLT AND NUT

COCK

PACKED PLUG COCK

THE LARGEST ALL-ATERITE GATE VALVE EVER MADE

GAUGE

# ATLANTIC TANK & BARREL CORPORATION

Established 1853

15th & Jefferson Streets

HOBOKEN, N. J.

Factory  
HOBOKEN, N. J.

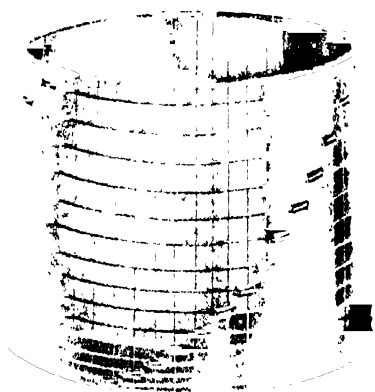
Factory  
LOUISVILLE, KY.

## PRODUCTS

Wooden Tanks, Round, Rectangular, Oval and Half-Round; Lead-Lined Tanks; Tanks with Stirrers; Tanks with Perforated False Bottoms; Special Tanks of all kinds supplied in accordance with specifications.

## TANK MANUFACTURERS FOR MORE THAN SIXTY YEARS

Our Company has been manufacturing wooden tanks for over sixty years and has always maintained a reputation for furnishing the highest quality of tanks possible. Our experience in the manufacture of tanks for the chemical and dyestuffs industries has covered every branch of this field and we have furnished the entire equipment for some of the largest plants, both in this country and in Canada.



STANDARD ROUND TANK

## SPECIALTIES

Agitators for Wood Tanks, Perforated False Bottoms, Lead, Copper and Zinc Lined Tanks.

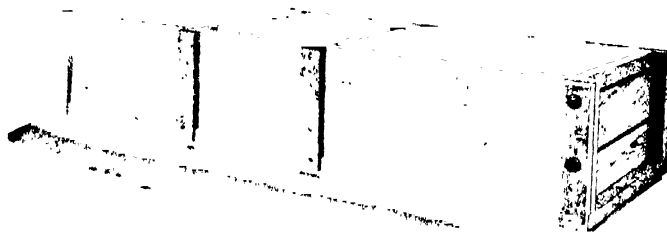
## OAK BARRELS

At our Louisville plant we make oak barrels, that will meet the most rigid tests for wood shipping containers. These barrels are used for shipping oils, alcohol, acids, dry colors, dyes and a host of other chemical products, also export wine shooks. First class workmanship goes into the making of each individual barrel. Send for our quotations.

Standard capacities are: 50/52 gals. and 53, 55 gals.



OAK BARREL



RECTANGULAR TANK

## MATERIALS

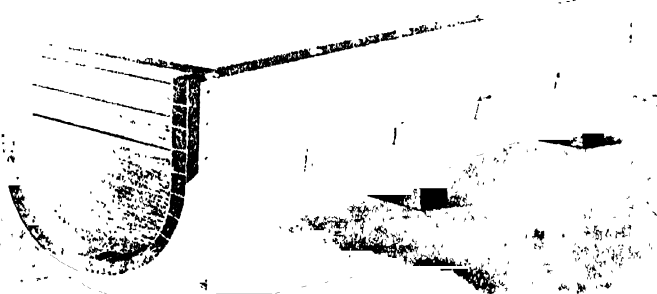
We carry large stocks of:

Long Leaf Yellow Pine, Oregon Fir, White Cedar, Gulf Cypress, White Oak, and California Redwood.

## LITERATURE

Write for our catalog E, giving tables of sizes, capacities, weights and full details about our tanks.

When writing for prices give as much information as possible; give capacity, widest diameter and height of staves, also whether inside or outside measurements; if possible state purpose for which the tank is to be used, for we can often make suggestions resulting in a considerable saving to our customers.



HALF-ROUND TANK

# THE ATLAS CAR AND MANUFACTURING CO.

Engineers Manufacturers

1140 Ivanhoe Road  
CLEVELAND, OHIO

## PRODUCTS

Cars (for any requirement)

Gable bottom, and Rotary dump

Electrically operated cars of all kinds

Coke Oven Equipment

Kiln Cars of all descriptions

Locomotives (Storage Battery and Electric)

Trucks and Tractors (Storage Battery)

Transfer Cars

Turntables

Industrial Track and Equipment

## CARS

An endeavor will be made to show only one car which is typical of a line or for a specific requirement. We build cars for all purposes and of any capacity.

We build and recommend equipment for any haulage requirement



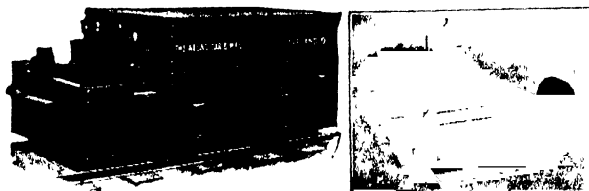
BATCH MIXING CAR

NO. 217-W  
EITHER SIDE DUMP SCALE CAR



NO. 161-A  
GABLE BOTTOM DUMP CAR,  
WITH TRIP AND BRAKE

NO. 217-EH  
LARGE CAPACITY  
ELECTRIC SIDE DUMP CAR

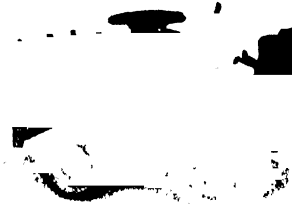


NO. 6000  
STORAGE BATTERY LOCOMOTIVE  
STANDARD TYPE "A"  
For Mine and Industrial Haulage

NO. 910  
ELECTRIC TRANSFER  
CAR

## STORAGE BATTERY TRACTOR, TYPE TE2

Four wheel steer, two or four wheel drive, Edison or Lead Battery equipment, normal load—10 tons Trailers and loading will operate in intersecting aisles 5'6" wide.



NO. 7025

## STORAGE BATTERY TRUCK TYPE H.P.

Four wheel steer, two wheel drive, load platform 42" x 84" x 24" high 4000 lbs. capacity Will operate in intersecting aisles 6'0" wide.



NO. 7126

## COKE OVEN EQUIPMENT

Pushers and levelers,  
Coal Charging Larries,  
Scale Cars, Door Machines,  
Quencher Cars, Electric Locomotives.

An engineering staff with wide experience on coke plant machinery is available and capable of handling any haulage problem in this field.



NO. 450  
COAL CHARGING LARRY



NO. 480  
COKE QUENCHING CAR

NO. 6525  
ELECTRIC LOCOMOTIVE

# ATLAS ELECTRIC DEVICES CO.

Apparatus for Testing Fastness to Light of Dyes and Inks

365 W. Superior St.

CHICAGO, ILL.

## PRODUCT

The **Fade-Ometer**

## USED BY

Dyestuff manufacturers and dealers  
Dyers  
Textile manufacturers  
Clothing manufacturers and dealers  
Paper mills  
Ink makers  
Printers  
Lithographers  
Billboard advertisers  
Chemical laboratories  
Testing laboratories  
U. S. Bureau of Standards

## PURPOSE

Fading and color tests of dyed textiles such as woolens, silks, prints, carpets, velvets, plushes and upholstery.

Fading and color tests of wall-paper, lithographs, printed posters, bankers' safety paper, colored paper, cartons, labels, printed tinplate, inks and combinations of inks.

Fading and color tests of paints, varnishes, oil and water colors, stains and lacquers.

## THE ACTIVE ELEMENT

The **Fade-Ometer** uses the Violet Carbon Arc which provides a light rich in ultra violet rays to the same degree as midsummer sunlight. It is **not** a mercury arc or quartz tube light. The fading effect of the Violet Carbon Arc is the same in quality as sunlight, but is much more rapid and is available day and night, summer and winter, without variation or interruption.

## LITERATURE

Bulletin No. 60 fully describes and illustrates the **Fade-Ometer** with directions for its operation.

Bulletin No. 40 is the reprint of an article by Mr. H. B. Gordon of the U. S. Testing Co. of New York, comparing in detail the fading results of sunlight, the **Fade-Ometer** and the Mercury Arc light.

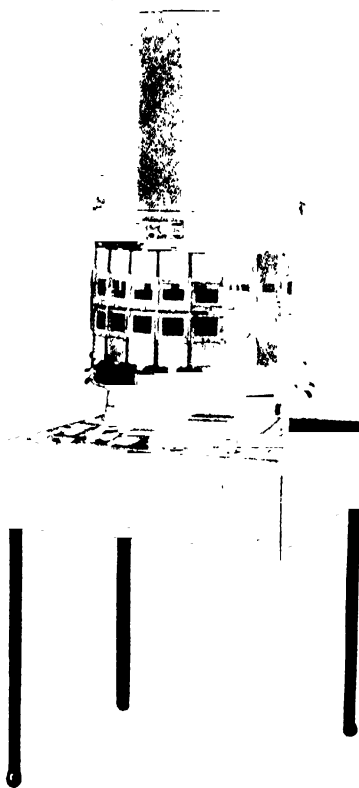
Write for these bulletins.

## DESCRIPTION

The **Fade-Ometer** consists of a Violet Carbon Arc light mounted on a supporting stand with self-contained rheostat and with a movable shield carrying the holders for the specimens or swatches to be exposed to the light. The lamp mechanism is entirely

automatic in its action and can be supplied for 110 Volts to 250 Volts D. C. and 110 Volts to 550 Volts A. C.

Two sizes are made, the Industrial Type with holders for testing 40 specimens at one time, and a smaller Laboratory Type holding 20 specimens and arranged for bench mounting.



THE FADE-OMETER, INDUSTRIAL TYPE

With movable shield lowered to operating position

## WHAT THE USERS SAY

Bachmeier & Co., New York (dyestuffs). "We have found the **Fade-Ometer** very satisfactory in every way. We have made tests not only of our own colors, but also for a number of our customers and so far have received no criticism of our reports.

"The fact that we recommend it to our friends is evidence of our approval."

Hart, Schaffner & Marx, Chicago (makers of men's clothing). "We have been satisfied with its performance and results, and altogether we feel gratified over having installed it."

Fox River Paper Co., Appleton, Wis. (makers of writing papers). "The **Fade-Ometer** has proven very satisfactory for our work, permitting us to test out at any time the fastness to light of dyes used in our papers and in matching colors."

Philip Ruxton, Inc., Chicago (Ink Makers to Particular Printers). "We have been using the **Fade-Ometer** for some time and find that we are able to check up our color matches as to their permanency before making shipment."



# ATMOSPHERIC CONDITIONING CORPORATION

Manufacturers of Equipment for Maintaining Artificial  
Atmospheric Conditions in Industrial Plants

437 Chestnut Street  
PHILADELPHIA, PA.

CANADIAN REPRESENTATIVES  
**DARLING BROTHERS, LTD.**  
120 Prince Street  
MONTREAL, P. Q.



EUROPEAN REPRESENTATIVES  
**ATMOSPHERIC STEAM HEATING CO., LTD.**  
22 Broadway, Westminster  
LONDON, S. W., ENGLAND

Representatives in the Principal Cities of the United States

## PRODUCTS

Webster Air Washers  
Humidifiers and Dehumidifiers  
Cooling and Drying Apparatus  
Generator Coolers  
Webster System of Automatic Humidity Control  
Spray Nozzles  
Dr. Hill Dust Counters

## WHAT WE ACCOMPLISH

The addition of the proper percentage of humidity to make up deficiency.

The removal of excessive humidity when high moisture content in the air prevents proper drying or carrying out of certain processes.

Maintaining either high or low temperatures where local conditions or specific materials demand such treatment.

The maintenance of uniform humidity conditions within 2% of that for which it is set.

The maintenance of working spaces at the Comfort Zone to insure efficiency of employees.

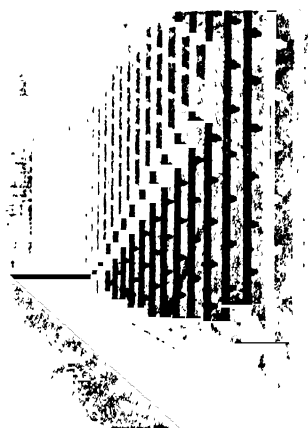
The cleansing and cooling of air for the ventilation of Turbo Alternators, equipment commonly known as Generator Coolers.



**ATMOSPHERIC DEHUMIDIFIER**  
Installed in Large Industrial Plant Manufacturing Food Products

## WEBSTER AIR WASHERS

**Type "A" Apparatus**—Designed primarily for air washing in connection with ventilating systems in public buildings, where a moderate cooling effect by evaporation is desired.



**VIEW OF SPRAY CHAMBER**  
Showing Operation of Nozzles in Atmospheric Equipment

**Type "B" Apparatus**—Designed for air washing in public buildings and Industrial plants, where the greatest possible cooling effect by evaporation is desired. Webster System of Automatic Humidity Control may be applied to the various types of Webster Air Washers, Humidifiers and Dehumidifiers. Perfect in principle and accurate in operation—the chief controlling thermostat subject to water, a medium with four times the specific heat of air.

## SERVICE

Our Engineers are available at all times for investigation of conditions and consultation regarding the adaptability of our apparatus.

We will not undertake a contract where we cannot accomplish just the results the buyer wishes, but where we do accept an undertaking we will give our best thought and skill to its complete accomplishment.



# AUDUBON WIRE CLOTH CO., INC.

Manufacturers of Wire and Wire Cloth for All  
Industrial Uses

AUDUBON, N. J.

**AUDUBON**  
WIRE PRODUCTS  
for Industrial Uses

## PRODUCTS

Double Crimp Heavy Steel Wire Screen in all metals  
Steel or Galvanized Wire Cloth  
Copper and Bronze Wire Cloth  
Bronze Strainer Cloth  
Brass Filter Wire Cloth  
Mill, Mine and Quarry Screens  
Wire Window Guards, and Partitions  
Elevator Enclosures  
Skylight, Machine or Radiator Guards, Grills and  
Railings, Brass or Iron  
Baskets, Crates, Trays, Spark Guards  
Cages  
Special Forms  
Foundry Riddles  
Desk and Counter Railings

### DOUBLE CRIMPED HEAVY STEEL WIRE SCREEN

For screening in Coal Mines, Quarries, etc. From 3 16" to 4" spacing, and from .092" to 1" wire.

### STEEL OR GALVANIZED WIRE CLOTH

For general uses where a cloth of better than average strength and wearing quality is desired. From .0053" to .928" spacing, and from .0053" to .307" wire.

### TINNED MILLING GRADE SCREEN OR WIRE CLOTH

For general industrial use where a rust resisting screen is required that will cost less than brass, copper or bronze. From .0102 to .446" spacing, and from .0065" to .054" wire.

### BRASS, COPPER OR BRONZE WIRE CLOTH

Used extensively for ordinary industrial filtering by either gravity or pressure, and where extra precaution is unnecessary. From .0068" to .935" spacing, and from .0065" to .250" wire.

### EXTRA FINE MESH BRASS WIRE CLOTH

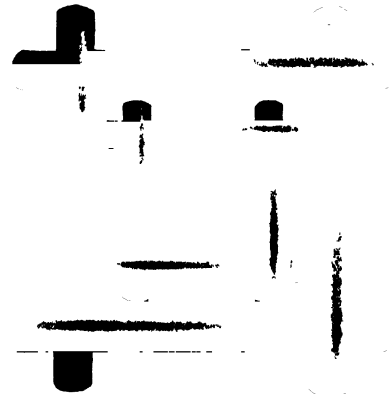
For extra fine screening—made in meshes from 110 to 300 with spacing from .0027" to .0051" and with wire from .0023" to .0045".

### BRASS STRAINER CLOTH

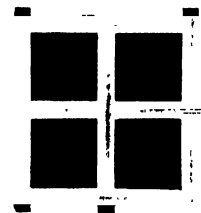
For straining milk or any liquid or substance that could be strained through a milk strainer, made in 40, 50 and 60 mesh.

### BRASS FILTER WIRE CLOTH

A Dutch woven cloth that is made of brass of tinned brass and is used extensively in all sorts of Centrifugal Straining—especially in sugar mills. Made 10 x 80 mesh, 12 x 120 mesh and 14 x 120 mesh.



DOUBLE CRIMPED HEAVY STEEL WIRE SCREEN

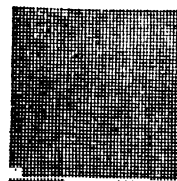


2 Mesh 105

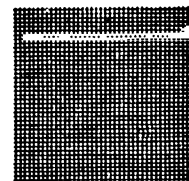


60 Mesh 0085

STEEL GALVANIZED WIRE CLOTH

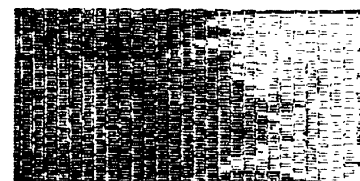


No 54



No 60

BRASS MILK STRAINER CLOTH



BRASS FILTER WIRE CLOTH

## CATALOG

To have a really comprehensive idea of Audubon Products you should have our catalog, of course—a postal will bring it to your desk. In addition to description and illustrations of Audubon Products, it contains also some very useful data, and plain instructions for ordering.

# THE AUTOMATIC REFRIGERATING COMPANY

## Automatically Controlled Refrigerating and Ice Making Plants

MAIN OFFICE AND WORKS

HARTFORD, CONN.

### BRANCH OFFICES

Atlanta, Ga.  
Boston, Mass.  
Chicago, Ill.  
Cleveland, Ohio

Honolulu, T. H.  
Huntington, W. Va.  
Los Angeles, Calif.  
New York, N. Y.  
New Orleans, La.

Rochester, N. Y.  
Seattle, Wash.  
San Francisco, Calif.  
Washington, D. C.

Houston, Texas.

### AGENCIES

Baltimore, Md.

### PRODUCTS

Completely Automatic Ammonia Compression Refrigerating and Ice Making Plants, including Compressors, Condensers, Coils, Piping, and Traps, and Automatic Controlling and Safety Devices for Refrigerating Plants.

### ADVANTAGES AND SCOPE OF UTILITY

Chief among the numberless and varied uses of refrigerating and ice making plants are their advantageous application to industrial needs. Automatic refrigerating equipment designed for large industrial establishments is especially adapted to conditions where absolute control of temperatures is necessary, such as calibrating thermometers and instruments, quenching baths for tempering steel and high grade tools, caustic soda dipping tanks for textile mills, paraffin coated paper manufacture, absolute temperature control of chemical process and air conditioning.

### TEMPERATURE CONTROL

In the chemical industry particularly, the maintenance of exact temperatures is absolutely necessary. An Automatic Refrigerating Plant will maintain any desired temperature within a degree or two of predetermined points with practically no personal attention. Automatic equipment is designed to meet the most exacting individual requirements of the chemical industry.

### AUTOMATIC REFRIGERATING PLANTS

These plants (fully patented) are designed to provide mechanical refrigeration without the necessity of an operating engineer. Automatic devices absolutely control the starting and stopping of the machine as temperature in compartments rises above or falls below predetermined points, and also control feed of ammonia to expansion coils and feed of water to condenser. Safety devices immediately stop the plant in case of trouble with water or electric power service.

### COMPRESSORS

They are of the vertical 2-cylinder, single acting, enclosed type, built to low capacity, accurate dimensioning, with parts interchangeable. They are provided with adjustable discharge valves and "safety heads" to prevent damage to cylinder heads from non-gaseous substances getting



AMMONIA COMPRESSOR

ting into cylinders. Pistons are provided with balanced suction valves, assuring full capacity suction stroke. The stuffing box, packed with semi-metallic packing, is made especially long, providing a long bearing and lubricating surface to the crankshaft and reducing to a minimum any chance of ammonia leaks. The compressors are built from  $\frac{1}{2}$  ton to 32 tons refrigerating capacity per 24 hours. The construction is particularly rugged and all parts are thoroughly tested.

### AUTOMATIC CONTROL

The control equipment is mechanically correct and of rugged construction, therefore thoroughly dependable. It includes a specially designed switchboard, equipped with Automatic safety devices that shut the machine down and cut off all power in the event of trouble in the electric service, preventing danger of damage to motor.

### THERMOSTAT

The thermostat, very sensitive to changes in temperature, controls the starting and stopping of the machine so as to maintain any desired temperature within a degree or two of a predetermined point, preventing consumption of power except when the temperature requires it.

### AUTOMATIC EXPANSION VALVE

Automatically controls the feed of ammonia to the expansion coils, thus maintaining the most economical pressure for the expansion of the liquid ammonia in the coils. It is easily adjusted and functions perfectly.

### AUTOMATIC WATER REGULATOR

Automatically controls the flow of water to the condenser, and automatically adjusts the water use to requirements of the plant. The action of the water valve is powerful and positive and water waste is eliminated.

### AUTOMATIC HIGH PRESSURE CUT-OFF

Automatically stops the plant should the head pressure approach the danger point, due to failure of water supply or any other cause. It puts the plant in operation again when the cause of the high pressure is eliminated.

### REPAIR PARTS

All parts of Automatic Plants are subjected to rigid test and are interchangeable. A complete stock of repair parts is always carried, making it possible to replace any part with the least possible delay.

### CO-OPERATIVE SERVICES

Our engineering department will gladly co-operate with engineers in the solution of special problems affecting mechanical refrigeration. The service, including preparation of drawings and data, is at the disposal of clients and entails no obligation.

# THE BABCOCK & WILCOX COMPANY

## Manufacturers of Water Tube Boilers, Superheaters and Stokers

85 Liberty Street  
NEW YORK, N. Y.

### BRANCH OFFICES

Boston, 49 Federal Street  
Philadelphia, North American Bldg  
Pittsburgh, Farmers Deposit Bank Bldg  
Cleveland, Guardian Bldg  
Chicago, Marquette Bldg  
Cincinnati, Traction Bldg  
Detroit, Ford Bldg

Atlanta, Candler Bldg  
Tucson, 21 E. Stone Avenue  
New Orleans, 521 E. Baronne Street  
Denver, 435 Seventeenth Street  
Salt Lake City, 705 706 Kearns Bldg  
Honolulu, H. L. Castle and Cooke Bldg  
Fort Worth, Flatiron Bldg

San Francisco, Sheldon Bldg  
Los Angeles, 404 406 Central Bldg  
Seattle, L. O. Smith Bldg  
Havana, Cuba, Calle de Aguiar 104  
Houston, Southern Pacific Bldg  
San Juan, Porto Rico, Royal Bank Bldg

## PRODUCTS

**Oil Heaters for supplying hot oil for process work requiring high temperature and close temperature control; Water Tube Boilers of the Babcock & Wilcox, Stirling and Rust types; Steam Superheaters; Chain Grate Stokers; Oil Furnaces for Boilers.**

## OIL HEATERS

The first Babcock & Wilcox Oil Heater for process work was supplied in 1908. The hot oil was used to permit close temperature regulation. Since then the Babcock & Wilcox Company has furnished oil heaters of various types and for a wide range of operating conditions to chemical industries. Its experience in building such heaters and in installing oil-burning apparatus will be helpful to chemical engineers who are designing process plants where hot oil will be used.

## WATER TUBE BOILERS

The Babcock & Wilcox Boiler has been used extensively in the chemical industry where dependability and efficiency are desirable. This boiler is of the horizontal type. The Stirling Boiler, which is of the semi-vertical type, is also widely used in the chemical industry. The Rust Boiler, of the vertical type, has found its main use in the iron and steel industry.

These types are distinct, yet in each the design meets successfully the four main requirements for economical boiler operation, namely, the pressure parts are supported independent of the brickwork, all metal parts are free to expand and contract, all pressure parts are readily accessible for inspection and repair, and the circulation of water and furnace gases is so free that the boilers can be operated at high ratings without serious loss of efficiency.

In the past decade, higher steam pressures and higher superheat have come into every-day practise,

and with these changes have come larger units and higher rates of combustion, due to better stokers and furnace arrangement, better feed water treatment, and a better understanding of boiler operation. Great improvements have been made in the utilization of other fuels than coal. These developments necessitate a much more careful study of the size of plant, service conditions, fuel, water and labor. Each prospective boiler installation is regarded as an entirely new and independent engineering problem, the various factors involved determining the particular type, size and setting of boiler recommended.

The boilers are built in accordance with the Boiler Code of The American Society of Mechanical Engineers, and a certificate of shop inspection by the Hartford Steam Boiler Inspection & Insurance Company or other qualified inspection company will be furnished.

## STEAM SUPERHEATERS

Steam superheaters were introduced commercially in the United States by this company, and many installations for furnishing superheat for both power and process work have been made in chemical industries. The company builds both integral and separately-fired superheaters and some of the latter type which it has designed are for very high temperatures and pressures.

## CHAIN GRATE STOKERS

Automatic stokers enable a boiler to be operated at higher capacity and with greater economy than hand firing permits. The chain grate stoker also enables very inferior grades of fuel to be burned with marked efficiency.

## PUBLICATIONS

These cover all products of the company and can be had at any Branch Office.

# BAILEY METER COMPANY

2021 East 46th Street  
CLEVELAND, OHIO

## PRODUCTS

Fluid Meters, Boiler Meters, V-Notch Weir Meters, Special Meters for Chemically Active Fluids and Gases, Recording Instruments. All manufactured under the trade-name "Bailey."

### BAILEY FLUID METERS

Bailey Meters are operated by a pressure difference which is produced by the fluid flowing through an orifice placed between a pair of flanges in the pipe line. There are but two moving parts to the meter and they are not subjected to the direct action of the steam, hot gases or other fluid being metered. Meters of special design can be made so that active liquids can not possibly come in contact with these parts. Other meters can be built with the parts of some special material not affected by the liquid or gas to be metered.

The orifice serves the same purpose as a Venturi tube, but is much easier to install and is more accurate for measuring steam, water, air or gases. In special cases the orifice may be constructed of steel, brass, aluminum, glass, hard rubber, or other special material. The pressure loss is too small to be noticed. There is no change in the orifice due to wear or scale.

The capacity of the meter is readily changed by exchanging orifices. The meter can be used for portable work or permanently piped to two or more orifices in different pipe lines and switched from one to another by merely changing valves.



TYPE C2  
FLUID METER

### FLUID METER, TYPE C2

Records Rate of Flow of steam, water, air or gas on the outer 2¼-inch section of a 12-inch chart; integrates total flow; and can be equipped to record pressure or temperature on the inner 2-inch section of the same chart. Net pressure drop one-half pound.

### GAS METER, TYPE C10

Records Rate of Flow of low-pressure gas (by-product coke-oven, illuminating, etc.) with 4¼-inch pen motion on a 12-inch chart and integrates total flow reading directly in cubic feet. It can be equipped to record pressure or temperature. Net pressure drop ½ inch water pressure.

### BAILEY BOILER METER

This meter records Steam Flow, Air Flow and Flue Gas Temperature all on the same chart. It may also

be provided with Fire-Box Draft Indicator, Wind-Box Pressure Recorder, Steam Flow Integrator or other useful supplemental records or indicated results essential to the operation of the furnace or stoker.

The most important feature of this meter lies in the ratio between the Steam Flow and Air Flow. Air is a fuel just as much as coal and a certain evaporation per pound of air should be obtained. When this condition exists the two pens and records show the same reading. When there is an excess of air, the Air Flow reading is greater than the Steam Flow. A deficiency of air, resulting in loss due to unburned gases, is shown by the Air Flow reading being less than the Steam Flow.

The Flue Gas Temperature record on the same chart is a positive check against dirty tubes and leaky baffles.

### BAILEY WEIR METER

Records Flow of Water or other liquid through V-notch or rectangular weirs on uniformly graduated chart without the use of cams or other complicated mechanism. The meter is equipped with integrator reading directly in pounds or gallons. For feed-water, hot well discharge, etc., at or near atmospheric pressure. May be made of special materials to withstand various liquids.

### OTHER TYPES

Many other types of recording meters for special purposes such as Specific Gravity of liquids or gases, Relation between the Flow of two fluids or gases, Differential Pressure Recorders accurate to 1-1000 inch water pressure. We can build special meters for any liquid or gas.

### SOME USERS

American Cyanamid Co.,	New York, N. Y.
American Hard Rubber Co.,	Akron, Ohio.
American Steel & Wire Co.,	Cleveland, Ohio.
American Sugar Refining Co.,	New York, N. Y.
Barber Asphalt Paving Co.,	Maurer, N. J.
Belgo-Canadian Pulp & Paper Co.,	Shawinigan Falls, P. Q.
Bethlehem Steel Co.,	Bethlehem, Pa.
Cambria Steel Co.,	Johnstown, Pa.
Champion Fibre Co.,	Canton, N. C.
Denver Gas & Electric Light Co.,	Denver, Colo.
Duquesne Light Co.,	Pittsburgh, Pa.
Federal Rubber Co.,	Cudahy, Wis.
Fiberloid Corporation, The,	Indian Orchard, Mass.
Firestone Tire & Rubber Co.,	Akron, Ohio
B. F. Goodrich Co.,	Akron, Ohio
Goodyear Tire & Rubber Co.,	Akron, Ohio.
Hood Rubber Co.,	Watertown, Mass.
Inspiration Consolidated Copper Co.,	New York, N. Y.
Laurentide Company, Ltd.,	Grand Mere, P. Q.
Merrimac Chemical Co.,	Boston, Mass.
National Fibre & Insulation Co.,	Yorklyn, Del.
Pierce Oil Corporation,	New York, N. Y.
Solvay Process Co.,	Syracuse, N. Y.
Tennessee Coal, Iron & Railway Co.,	Birmingham, Ala.
U. S. Bureau of Mines,	Pittsburgh, Pa.
U. S. Ordnance Dept.,	Washington, D. C.

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Atlanta, Candler Bldg  
Tucson, 21 E. Stone Avenue  
New Orleans, 521 E. Baronne Street  
Denver, 435 Seventeenth Street  
Salt Lake City, 705 706 Kearns Bldg  
Honolulu, H. L. Castle and Cooke Bldg  
Fort Worth, Flatiron Bldg

San Francisco, Sheldon Bldg  
Los Angeles, 404 406 Central Bldg  
Seattle, L. O. Smith Bldg  
Havana, Cuba, Calle de Aguiar 104  
Houston, Southern Pacific Bldg  
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## STEAM SUPERHEATERS

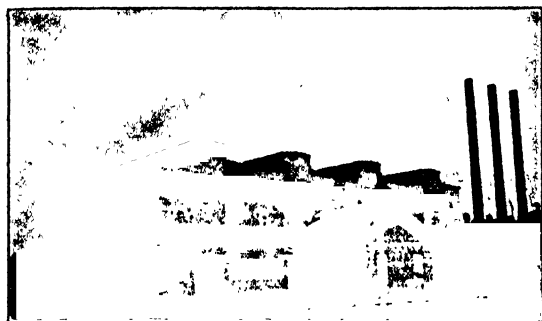
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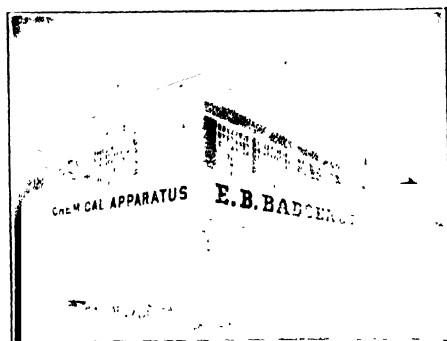
BADGER ENGINEERS SUPERVISE EVERY STAGE OF THE CONSTRUCTION OF A COMPLETE PLANT

therefore, been developing this **Badger Service**, and as a result have been in a position to demonstrate the truth of our assertions many times during the great chemical developments in this country resulting from the war.

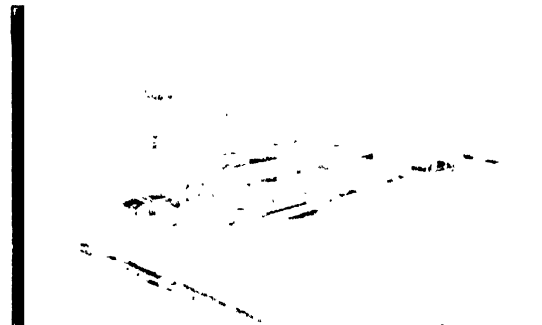
Many plants have been comparative failures because the owners did not realize that a consulting engineer is often lacking in construction knowledge and that metal workers are lacking in the necessary knowledge of chemical engineering, and above all, that research is a fundamental requirement in the development of any industry.

Through research and laboratory work we are able to develop chemical processes, to determine the proper general design of equipment, and the best materials to use in construction; through our engineering organization, in conjunction with shop, we are able to coordinate the results of experimental work and to determine on the proper design and construction of apparatus; through our shop and business organization we are able to make prompt and reliable shipment of equipment and to handle properly the details involved in construction of complete plants, and in conjunction with laboratories provide facilities for quick completion of experimental equipment; and finally through our engineering organization again, we are in a position to supervise the design of complete plants and to render invaluable service required in connection with the development of all new industries, in erection and operation of plant, advice as to purchase of materials, and disposal of products, etc.

On the following pages we describe certain equipment which we furnish. It is impossible, of course, to go into specific details, or to cover all of our apparatus. We can give detailed information on any of our products on request.



ASSEMBLY PLANT AND MACHINE SHOP FOR HEAVY WORK



### SHOP ORGANIZATION

We have previously mentioned the great importance of proper manufacturing organization to make possible prompt shipments.

We have organized an employment department to handle the labor question, and expect shortly to start a trade school to train men in the different branches of our work, since there are not sufficient trained mechanics available in the United States today for our class of work.

We have an organization entirely concerned with the handling of raw materials, following orders and shipments, handling shipments of material from our plant, etc. During the war when practically every industry was handicapped through failure to deliver machinery on time, we were able substantially to live up to our schedules and were highly commended for our work in this line by the Government.

### OUR WORK DURING RECENT YEARS

The extent and quality of our service and equipment cannot be better illustrated than by specific reference to the large variety of work undertaken and built by us during the period of the Great War. While a great deal of this work was of nature such that it will not be duplicated in the future, yet the service and equipment supplied is similar to that necessitated by present day work. Our work at the present time involves as large, if not as great, a variety of machinery and effort.

The present period of reconstruction is presenting equally interesting problems to us for solution as those which we overcame in the days of the War. At no time has it been more necessary than at the present to introduce every possible economy in production, and to recover every valuable by-product.

The necessity for producing in large quantities such products as ammonia, alcohol, acetone, ether, acetate of lime, smokeless powder, benzol, toluol, caustic soda, etc., and of getting these materials out in the shortest possible time, and in the most economical manner, required the services of an experienced and efficient organization, and the volume of work which we undertook and completed without, in a single case, holding up the output of the plant where machinery was installed, is a sufficient testimony as to our ability.

The production of smokeless powder alone required the manufacture in various plants of the United States and Canada of around 2,500,000 lbs. of ether per day, and the recovery of an approximately equivalent amount of ethyl alcohol.

Approximately 95 per cent. of all of the distilling equipment used for this work in the United States and

*Continued on Next Page*



CANADIAN ELECTRO PRODUCTS CO.'S PLANT, SHAWINIGAN FALLS, P. Q.

Canada was furnished by us, and we have received the highest testimonials as to the quality of the workmanship, speed in delivery and erection, and efficiency of equipment in question.

In the case of the United States Government Explosives Plant at Nitro, West Virginia, having a capacity of 625,000 lbs. of smokeless powder per day we equipped six complete ether-alcohol plants, furnishing the design of plants, and constructing, installing and operating all of the machinery.

The production of ammonia is a very important matter. We designed and installed very large equipment for the production of pure anhydrous ammonia from crude aqua ammonia, also installed all of the distilling machinery of special design and construction required in the production of ammonia gas.

The shortage of acetone for the manufacture of cordite was a very serious factor at the beginning of the war. Practically the only source of production of this material in 1914 was acetate of lime. The enormous demand necessitated not only the erection and enlargement of wood distillation plants, in order to increase the supply of acetate, but also the erection of acetone plants for producing acetone from acetate. It was furthermore necessary to develop various other sources of production of this material, and in this work we were very active.

One of the largest plants in the world producing acetic acid and acetone—that of the Canadian Electro-Products Company at Shawinigan Falls, Quebec, Canada—is equipped throughout with distilling machinery and other equipment of our design and manufacture. We not only constructed the larger part of the experimental equipment for developing the process employed for the production of acetic acid from acetylene, but assisted in the design and arrangement of plant and furnished the larger part of the very special and complicated machinery necessary.

The success of this plant is a sufficient testimonial to the ability of all concerned, and the successful operation of the equipment supplied by us was a vital factor.

Another product which was, as every one knows, of greatest importance was toluol, used in the production of trinitrotoluol, and its homologue, benzol, used in the production of phenol and picric acid.

We designed and installed a considerable amount of the first equipment erected after the beginning of the war for the recovery and refining of these products, and equipped complete two of the earliest and largest refineries turning out these materials.

We designed forms of refining stills which were an improvement on anything used before in this country for such work, and which permitted the production of the very highest grade of products such as were essential to the manufacture of the purest, stable and uniform explosives.

The production of the highest grade of phenol for the manufacture of picric acid was of first importance, and during the years of the war we supplied the largest concerns in the United States, manufacturing this material, with our special design of phenol refining stills, which permitted the production of a higher grade of product than had been before commercially manufactured in this country.

The wood distillation industry yielded acetate of lime produced in the production of acetone and acetic acid, and methyl alcohol used in the manufacture of methyl acetate, all of these products being used in the production of airplane dopes and solvents for such dopes.

We not only furnished a large amount of equipment to many of the wood distillation plants, but designed and equipped substantially complete three of the largest refining plants for wood distillation products in the United States.

The recovery of solvent used in the manufacture of smokeless powder is another important line of work. We designed and installed a large amount of equipment of new and special design which operated with great satisfaction, and effected a greater economy in the recovery of exceedingly scarce and valuable materials.

We have only mentioned above a few of the general propositions in which we had a particular hand. We were designing and manufacturing, however, at the same time hundreds, in fact, thousands of pieces of standard and special equipment for hundreds of the various concerns engaged in war work. Let us emphasize again, however, the fact that we describe this work, not for the mere purpose of enumerating our services, but to make plain the fact that under the extreme stress of war requirements we were chosen to do by far the larger part of work in our lines, and we were able to carry it out successfully on account of our efficient organization and extended experience. The same requirement for such experience and organization exists at the present time; in fact, under the more nearly competitive conditions prevailing, efficient machinery is, if anything, of greater importance.

#### COMPLETE PLANTS

We are in a position to furnish complete installations as well as special apparatus and machines for manufacturing, producing or extracting:

Acetic Acid	Tanning Extracts	Phenol
Acetone	Ethyl Ether	Salicylic Acid
Amyl Acetate	Fatty Acids	Methyl Alcohol, etc.
Dye-wood Extracts	Glycerine	

as well as a large variety of other products.

*Continued on Next Page*



## INDUSTRIAL ALCOHOL PLANTS

The production of industrial alcohol is destined to be a more and more important factor in the future. It is recognized that alcohol has advantages over gasoline and other hydrocarbons for use in internal combustion engines, and the increasing scarcity of gasoline will involve the more extended use of alcohol, and products containing alcohol, as time goes on. Moreover, there are a vast number of other important industrial uses for alcohol.

For years we were the sole representatives in the United States of Messrs. E. Barbet et Fils et Cie of Paris, France, the largest builders of complete alcohol plants in the world. They have installed plants for the production of alcohol from molasses, grain, potatoes and substantially every raw material commercially employed, in some thirty different countries of the globe.

We are in a position to design and install complete plants, embodying all of the latest improvements, such as pure yeast culture apparatus, continuous refining stills, centralized control, molasses sterilization equipment, etc.

Not only are we prepared to design, erect and place in operation new industrial alcohol plants, but we can also undertake to modernize already existing plants of this kind, and to modify beverage alcohol plants so as to make them suitable for the production of non-beverage alcohol.

**Continuous Stills**—Continuous refining stills offer many advantages as compared with discontinuous stills, and we regret to say that the increase in efficiency and the great economy to be effected by the use of this type of equipment have not yet been fully appreciated in this country.

The continuous still, as the name implies, is continuous in its operation, requiring a constant feed of ma-

terial to be distilled, a constant pressure of steam and a constant feed of water. As the feed of material to be distilled is regular and continuous, the concentration of the volatile liquid (alcohol) is therefore constant at any point in the system; hence the impurities can be collected and withdrawn at certain points on the still; and high grade alcohol at another place.

The following are principal advantages of Continuous Distillation:

Continuous stills require less than one-half the steam required by a discontinuous installation of the same capacity, consequently a smaller boiler plant is needed.

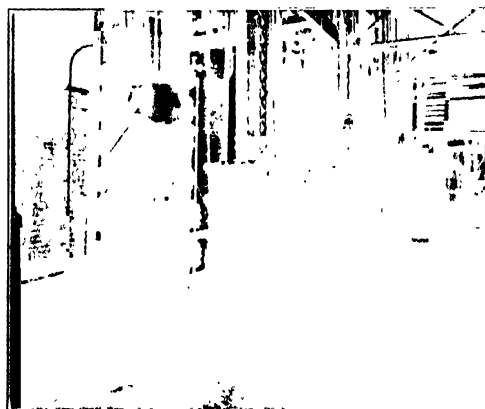
Continuous stills do not require as much room as discontinuous stills of the same capacity.

The continuous still requires less water for condensing than the discontinuous still.

Continuous stills are simpler to operate than discontinuous stills.

The products of a continuous still are much more uniform than from a discontinuous still.

Although a continuous still costs slightly more than a discontinuous still, it lowers the cost of operation and permits of a very considerable constant saving.



DISTILLING EQUIPMENT

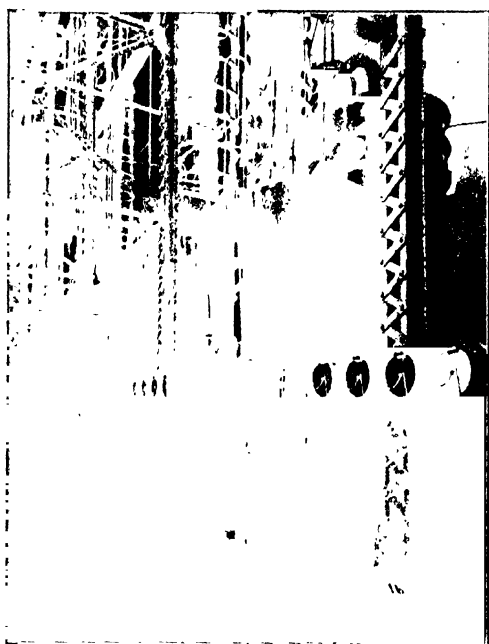
**Alcohol from Waste Sulphite Liquor.**—We have developed a process for the production of alcohol from waste sulphite liquor, formerly a by-product of the manufacture of sulphite pulp, and are in a position to furnish complete plants for carrying out this process. The gradual increasing agitation against the pollution of streams with such waste products will necessitate their utilization and disposal. Processes which we have developed will permit such disposal at a profit, instead of a loss.

**Dealcoholization**—The Constitutional Amendment prohibiting the manufacture, sale and transportation of intoxicating beverages, has necessitated the production of a large variety of substantially alcohol-free products, and many concerns find it necessary to manufacture a product containing alcohol, and remove the alcohol therefrom. Many brewers and wine manufacturers are manufacturing products as before and dealcoholizing such product later.

We have developed, after thorough experimentation, a very ingenious plant for dealcoholizing work.

We also manufacture a very efficient type of rectifying still for refining the alcohol so obtained.

For complete information on Badger Dealcoholizing Plants see page 325.



BADGER DISTILLING INSTALLATION SHOWING CONTROL EQUIPMENT

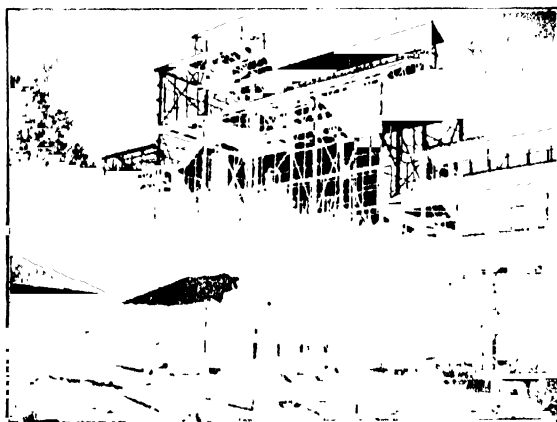
*Continued on Next Page*

### WOOD DISTILLATION PLANTS

We are the only concern in the United States in a position to equip and operate complete plants for the distillation of hard and soft woods, employing the most advanced types of equipment throughout. We build a large part of the equipment in our own shops, and have a force of technical experts to supervise the installation and operation. This staff includes technical engineers, two of whom have been for extended periods operating superintendents of the largest plants in the United States.

Our standard equipment includes the following:

- Retort Ovens
- Badger** Retort Cars
- Wood Predryers
- Charcoal Coolers
- Retort Condensers
- Badger-Webre** Single and Multiple Effect Evaporators
- Tar Stills
- Badger** Continuous Limeless Stills
- Badger** Concentrating Stills
- Complete Methyl Alcohol Refining Stills
- Filter Presses
- Mixing Tubs
- Acetate Dryers
- Pumps, Engines, Piping, etc., complete



WOOD DISTILLATION PLANT UNDER CONSTRUCTION

In practically every case this equipment represents great improvement over types formerly in use.

The wood distillation plants in this country formerly produced crude wood alcohol for sale to refiners, who controlled the markets and prices, and obtained most of the profit. It was not feasible for crude wood distillation plants to refine their product with the old style machinery. We introduced and perfected the **Badger** Continuous Refining Stills of various types and made it possible for the crude plants to manufacture, at no greater operating expense than was formerly required in the production of crude alcohol, any grade of refined product from 95% to 99.8% pure methyl alcohol containing as low as 2/100 of 1% acetone.

The production of acetic acid and acetone from acetate of lime is frequently carried out in conjunction with the refining operations. We are in a position to furnish the most up-to-date plants and refining equipment for manufacturing these products.

The wood distillation industry has utilized almost exclusively up to the present logwood and slabs, as processes for the handling of fine wood, such as sawdust and chips, and other finely divided cellulose products, such as cottonseed hulls, coconut shells, crushed corn cobs, etc., were not available. The necessity for conservation of resources has required the development of processes for the handling of such material, and we have been concerned with the development of various processes for this work.

Realizing the above we have been conducting complete and extensive experiments for three years, which have resulted in the practical perfection of a new, ingenious and patented process, permitting the handling in a much more economical manner than at present of finely divided cellulose products, which we feel will unquestionably revolutionize the wood distillation industry.

We refer to the **Stafford Process**.

This process was developed by Professor Stafford of the University of Oregon, from small scale experiments and has been thoroughly worked out by us on small plant scale.

The results have been such that we are now making an initial commercial installation for one of the largest concerns in the United States.

The principle of the Stafford Process makes use of the hitherto known, but not commercially utilized, heat of exothermic reaction of cellulose when at the carbonizing temperature. By predrying and preheating the material, and introducing it into a retort in which material already undergoing carbonization is present, the exothermic heat is sufficient under properly maintained conditions to bring the additional material up to the carbonizing point, when this material in turn will be carbonized and liberate heat, which will serve to bring further material to the carbonizing temperature.

All previous processes for handling finely divided material have endeavored to design a form of retort heated from the exterior, in which the material handled is agitated or heated in a thin film in such a way that the finely divided material will not insulate itself. These retorts therefore have involved mechanical features which have never been satisfactorily worked out, and have furthermore involved in most cases an overheating of the walls, tending to decomposition of the products, etc.

The Stafford Process requires no heating of the retort; in fact, the retort is thoroughly lagged to prevent escape of heat. The material is previously dried in contact with the air, and is introduced continuously into the retort from which the charcoal is also continuously removed.

The advantages of the process are numerous. We would enumerate a few of them as follows:

#### Cost of Raw Material

Whereas substantially all of the wood distillation plants in the United States use cord wood, costing from \$6 to \$10 per

*Continued on Next Page*

cord, for distillation purposes, the Stafford Process can utilize substantially any finely divided material, often waste product, the cost of which may be in some cases not more than 50c for the equivalent of a cord. The saving in this way may be very large.

#### Saving in Fuel

The heat of decomposition of the wood accomplishing the larger part of the work, the fuel consumption of a Stafford Retort System is very much less than that of an ordinary retort system, and the saving in this respect very considerable. The wood, furthermore, being previously dried, the volume of pyroigneous acid obtained is very much less than when using ordinary air dried log wood, and since in the refining process, this water must be evaporated approximately three times, the economy in steam consumption in the refining process is very much decreased.

#### Labor Economy

The process being continuous and substantially automatic, the labor requirement for the retorts is only a fraction of that necessary in the standard process. No men are required to load, transport and unload cars and retorts, etc.

#### First Cost

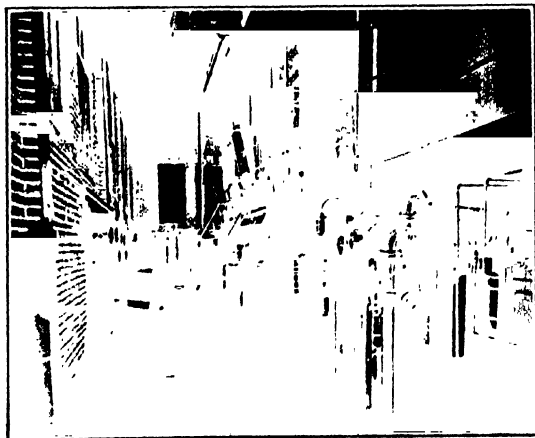
The first cost of the Stafford Process is very materially less than that of the standard retort system, and the interest and depreciation charges are therefore less. Furthermore, retorts not requiring severe heating on the exterior will probably have a very much more extended life.

There are also many other minor economies, such as water consumption, etc. It is very probable that with continuous operating retorts methods of handling the vapor can be devised which will involve great economies as compared with the present system. For instance, it will undoubtedly be possible to utilize continuous tar separating process, and make unnecessary the present process of redistillation of the pyroigneous acid to free it from tar. This will mean a very considerable economy in first cost of plant, as well as in steam consumption and labor.

The Stafford Process is applicable to handling materials other than cellulose products, and will undoubtedly find a very large application.

#### BENZOL AND TOLUOL PLANTS

Our special equipment for the above work includes **Badger** type scrubbers, **Badger** vacuum wash oil stills, **Badger** refining stills, **Badger** chemical agitators, **Badger** direct-contact oil coolers, etc. All of these types of machinery have been developed through our extended experience in other lines of distillation work.



VIEW IN BENZOL AND TOLUOL REFINING PLANT

#### STILLS GENERAL

We manufacture Stills for practically every commercial volatile product. These stills, according to the material handled, are of different types, such as: Continuous, Discontinuous, Pressure and Vacuum, etc., and are constructed of copper, cast iron, steel, aluminum, etc., according to the chemical action.

Our main object is to furnish the most efficient still possible for the purpose, and to give an apparatus which can be easily operated, which will be durable and give the highest grade of product possible.

#### MATERIALS HANDLED

We have furnished during the past few years installations handling more than 30 different products, such as Benzol, Acetone, Phenol, Ammonia, Aniline Oil, Ether, Carbon, Tetrachloride, Chlorobenzol, Chloroethane, Sulphur Chloride, Methyl Alcohol, Acetic Acid, Ethyl Alcohol, Acetaldehyde, Fusel Oil, Toluol, Anil Acetate, Salicylic Acid, Ethyl Nitrate, etc.

If the material is handled commercially, we can surely furnish apparatus for distilling, if not, we will undertake to design special apparatus.

#### EXPERIENCE

We have had experience in the building of distilling apparatus for more than 60 years, when the first simple forms of apparatus were installed in the United States.

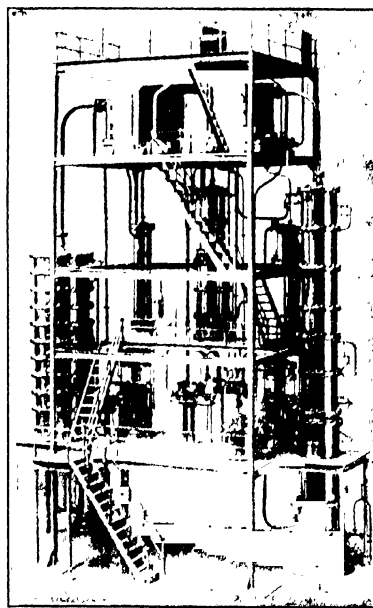
We have perfected in this country the highest type of refining stills, including continuous stills which will eventually replace in substantially every plant of considerable size the obsolete types of discontinuous equipment.

We were the first to install practical continuous stills in this country, and for years we represented the concern of E. Barbet et Fils et Cie, Paris, who were at that time the largest builders of distilling machinery in the world, and the first practical builders of continuous stills.

#### IMPORTANCE OF PROPER MACHINERY

There are few industries where problems involving distillation do not arise. We are safe in saying that more mistakes are made in the installation of improper apparatus of this type than in any other line of Chemical Equipment.

Usually Stills are employed in the final refining of a manufactured



BADGER-BARBET DISTILLING EQUIPMENT

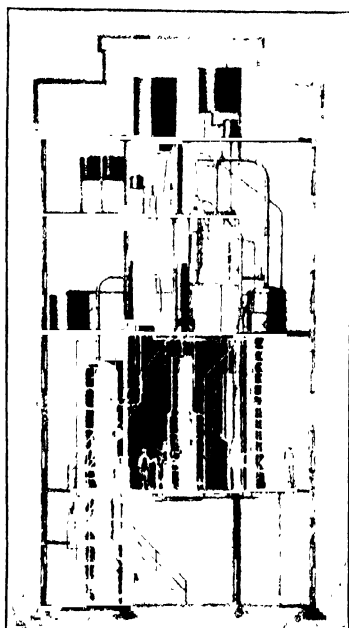
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**STILLS—Continued**

product, and the standard of quality is dependent upon the type of Still employed.

We have known of many plants possessing very costly machinery for the production of a crude material, who put out a low grade product simply because they have economized in the purchase of Distilling Apparatus, which is often a small item in the total equipment.

We will not make this statement general, but refer to specific cases where low grades of products such as Benzol, Acetone, Methyl Alcohol, Phenol, Aniline, Turpentine, Ethyl Alcohol, Toluol, Chlorbenzol, were put on the market, and the reputation of the concerns in question were jeopardized, merely on account of the type of Distilling Apparatus which they employed. It is, of course, not always a question of expense, for the better apparatus may be the cheaper.

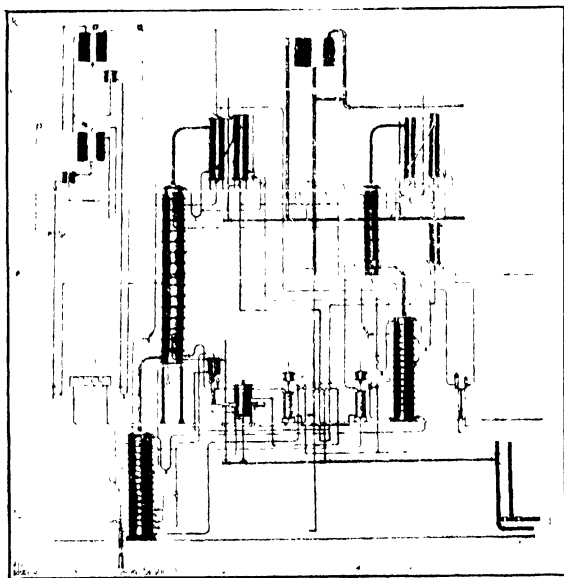


CONTINUOUS INDUSTRIAL ALCOHOL  
REFINING STILL

**CONTINUOUS STILLS**

We have referred to Stills of two general types—Continuous and Discontinuous.

Continuous Stills can be employed to solve almost any Distilling problem with, in most cases, enormous



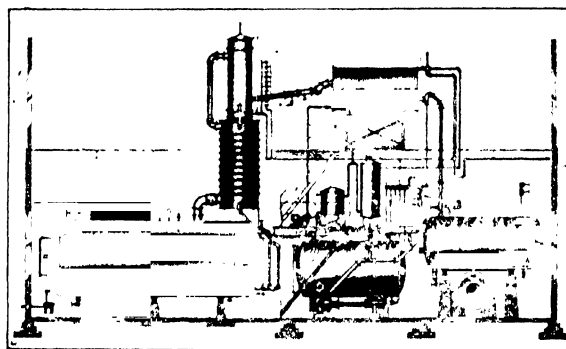
CONTINUOUS INDUSTRIAL ALCOHOL REFINING STILL

**STILLS—Continued**

savings. They have revolutionized the distillation of Ethyl and Methyl Alcohol throughout the world.

While these Stills are new to the United States, their advantages are rapidly being recognized, as the hitherto wasteful Chemical Industry appreciates their economy. Their advantages where they can be employed lie in economy in steam and water, less loss in distillation, more uniform grades of product, less labor in handling, often lower first cost, and finally, higher grades of product.

As stated above, continuous stills can be employed to handle almost any material, but have an especial advantage in handling such products as Ethyl Alcohol, Methyl Alcohol, Ammonia, Acetone, Ether, Acetaldehyde, Acetone



PHENOL OR ANILINE OIL REFINING STILL

**DISCONTINUOUS STILLS**

Discontinuous Stills are more applicable to the handling of some products than Continuous Stills.

We have developed many types of Discontinuous Apparatus, each of which comprises particular features peculiar to the **Badger** systems.

We have made many installations during the past year, which have been of vital importance to the success of the plant in question. It is a relatively simple matter to construct a Still which will handle a product such as Alcohol, but the construction of a Unit to handle even this product efficiently, or to handle such products as Phenol, Chlorine products, Acetic Acid, Salicylic Acid, Ether, Benzol, Fatty Acids, is an entirely different matter. Some of our special designs are handling the following materials: Benzol, Toluol, Chlorbenzol, Phenol, Aniline Oil, Salicylic Acid, Acetic Acid, Chloroform, etc.

**SPECIAL PROBLEMS IN STILL CONSTRUCTION**

While continuous stills and discontinuous stills of standard form can be applied to much work, it is practically always necessary to design special equipment. In many cases we have rendered exceptional service in this direction. Some of the problems which we have successfully solved are the following:

**ETHYL ALCOHOL**

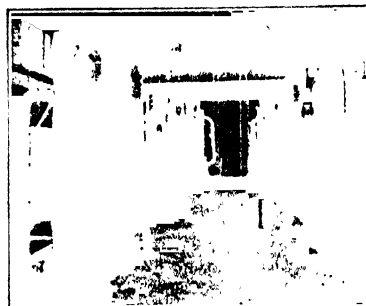
The distillation of Ethyl Alcohol in the United States was, up to recently, accomplished with a combination of so-called "Beer" Still and Discontinuous Recti-

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STILLS—Continued

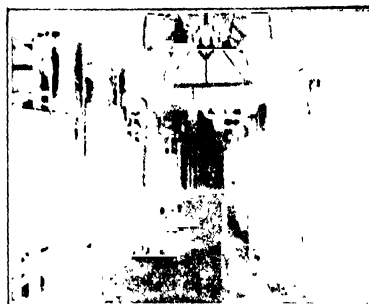
METHYL ALCOHOL AND  
ACETONE REFINING  
PLANT

Cleveland Cliffs Iron Company,  
Marquette, Mich.

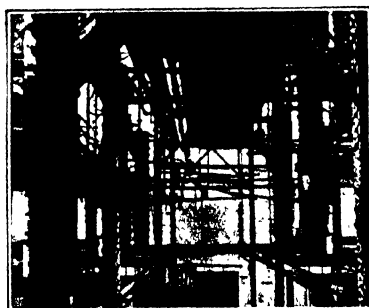


TOP FLOOR

Showing condensers, feed tanks, etc

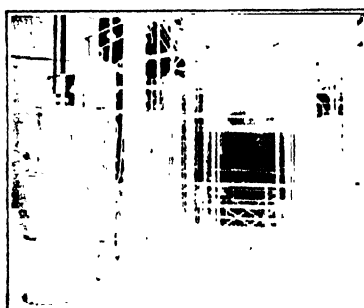


TOP FLOOR

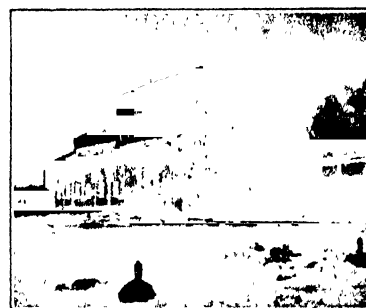


THIRD FLOOR

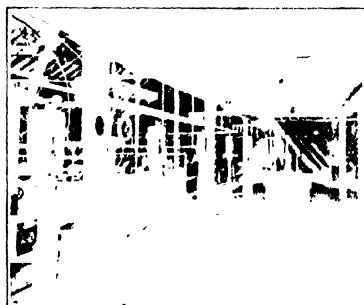
Rectifying columns



THIRD FLOOR

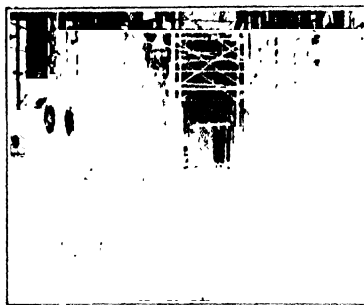


EXTERIOR VIEW



SECOND FLOOR

Showing gages, testers, regulators, etc



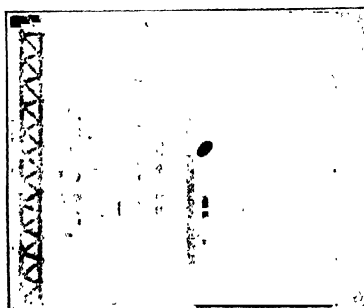
SECOND FLOOR

Showing gages, testers, regulators, also purifying columns



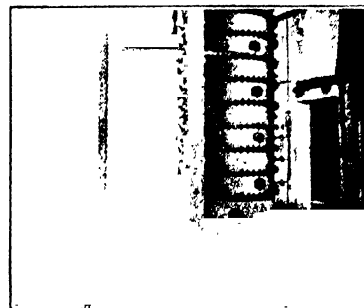
SECOND FLOOR

Receiving tanks

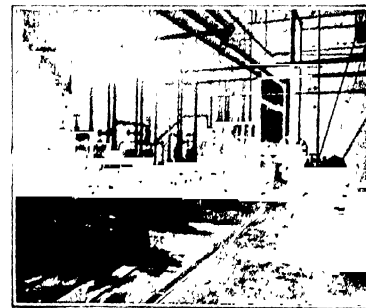


GROUND FLOOR

Exhausting columns



GROUND FLOOR



GROUND FLOOR

Pump room

Continued on Next Page

**STILLS—Continued**

fyng Still. This necessitated producing first a Crude Product and then refining same with a great deal of handling of Crude and intermediate products.

Continuous Stills now perfected, and installed by us, will produce the highest grade of refined alcohol exceeding that produced in any ordinary plant, with less than one-half the fuel expense of the old system, with a much lower loss of product, less labor, less danger from fire loss, and with the possibility of producing a refined product within a few hours after starting operation, as compared with 3 to 4 days under the old system.

**METHYL ALCOHOL**

The production of refined Methyl Alcohol was, up to within a few years, reserved for large producers of Crude, or for central refineries obtaining crude from many plants. This was due to the fact that the system of Discontinuous refining employed could not be operated practically on a small scale, and the initial cost of plant for small installations was out of all proportion to the returns.

We have developed and installed refining stills of our multiple column continuous type, producing 99.8% pure methyl alcohol direct from crude product, this methyl alcohol containing less than 2/100 of 1% acetone.

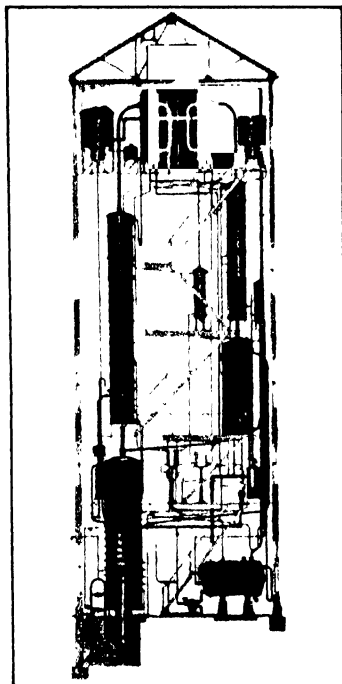
We have recently equipped complete a large refinery, photographs of which we show on page 317. This refinery contains two of our methyl alcohol refining stills of the type referred to above, also complete continuous acetone refining still, producing the highest grade refined product in one distillation from the crude.

**ACETONE**

The refining of Acetone compares closely with the refining of Methyl Alcohol, and the same types of equipment are applicable. The production of the grade of Acetone required for smokeless powder work necessitates the use of Continuous Stills, or very high costs of operation and loss of product with the Discontinuous system.

We have constructed during the past 2 years Units with an aggregate capacity of practically 12,000 gallons per day refined Acetone, meeting all British Admiralty tests and operating with great economy.

We have installed acetone stills for the refining of this product as produced from acetate of lime, also by direct contact from acetic acid, by fermentation from



CONTINUOUS METHYL ALCOHOL OR ACETONE REFINING STILL

**STILLS—Continued**

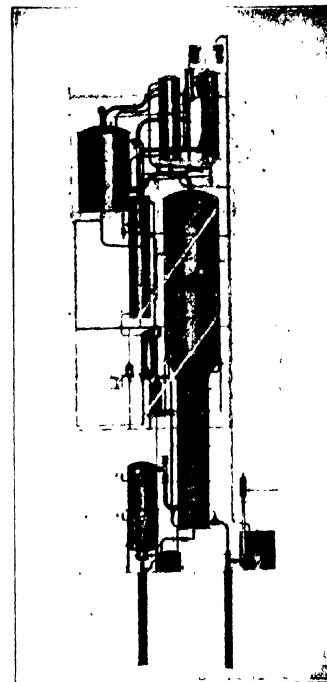
corn, and installations for its recovery where used as solvent.

**ETHER**

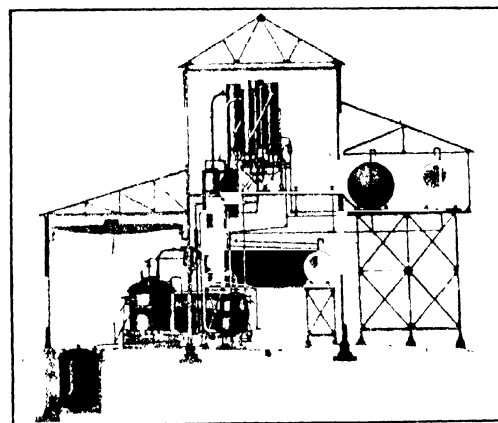
We are Constructors of probably 95% of the Ether Stills required for smokeless powder work in the United States and Canada.

A total capacity of these Units is in excess of 2,000,000 pounds per day. We have developed special types of Stills for this work and the number of installations testifies to their operation.

We installed during 1918 complete plants for the manufacture of ether and the rectification of alcohol for several large powder plants, where we have not only furnished the stills, but designed the entire plant, and superintended the installation and operation.



CONTINUOUS INDUSTRIAL ALCOHOL STILL



CROSS SECTION ETHER PRODUCTION PLANT

**AMMONIA**

The use of pure anhydrous ammonia for dye work, also the increasing appreciation of the fact that the purity of the anhydrous ammonia employed in refrigerating machines has a very considerable effect on the efficiency, have created a big demand for such product.

Furthermore the development of processes for the oxidation of pure ammonia to nitric acid makes it probable that such a commercial industry will be developed some time in the future.

Our type of refining stills have great advantages so far as economy in operation is concerned over other

*Continued on Next Page*

**STILLS—Continued**

types employed, and since cost is an extremely important factor, our type of equipment must be preferred.

**CHLORBENZOL**

The production of a relatively pure grade of chlorbenzol from crude is a problem requiring careful design on account of corrosion and other factors. We have designed special units for this work, which are in careful operation, and are even now introducing improvements which promise to give even better results. Large manufacturers of this product, employing our stills, find themselves in a far better position to meet competition and to operate without shutdowns.

**BENZOL**

We have developed special Units for Benzol and Toluol work, of cast iron construction with automatic flow and pressure regulation which are particularly adapted to the handling of a mixture of volatile products, each of which must be obtained in a pure form.

Our Benzol Stills differ materially in type from Units for handling other materials. We have in operation more than 60 Benzol Stills.

**PHENOL**

Any cast iron Still will produce Phenol, but safety, economy, and above all, quality, require carefully designed apparatus.

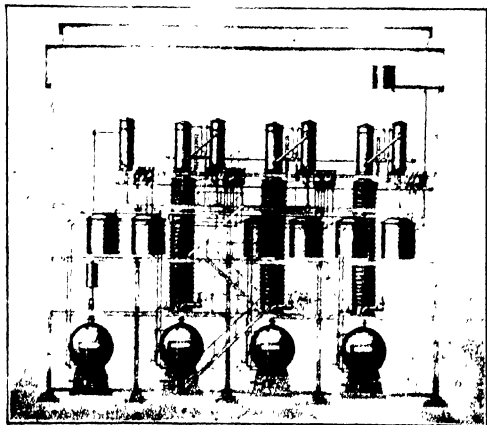
We have installations in operation which have an aggregate capacity of more than 190,000 pounds of pure Phenol per day.

These Stills have very special features and Plants equipped with our apparatus have set a standard of quality in this material. A poor Still means a poor product, no matter how expensive the rest of the plant may be.

One large manufacturer producing an exceedingly high grade of phenol purchased one of our stills of large size, later another unit, and more recently two more units at different times. This manufacturer has a national reputation on account of the quality of his product.

**SALICYLIC ACID**

The special design of Still with special lining required for handling this valuable product is right in our line. Equipment which we have furnished and have in successful operation, involves features which only long experience in design and construction has enabled us to work out.



BENZOL OR CHLORBENZOL REFINING STILLS

**STILLS—Continued****ACETIC ACID**

The construction of Acetic Acid Stills requires not only special knowledge of design, but expert knowledge of heavy copper and aluminum construction.

We construct complete Stills in our own shop, and have had many years' experience in this line. Our Apparatus has improvements over the German types formerly imported by manufacturers of this product.

**ANILINE OIL**

We construct Aniline Oil Stills of types similar to our Phenol Stills which produce grades of product far better than those manufactured by plants of the old style of equipment. A good still is essential to this work, but many concerns do not yet realize it.

The recovery of aniline from dilute water solutions in plants manufacturing this product is an operation for which our continuous stills are used to great advantage. Various concerns throw away such solutions, under the impression that the aniline cannot be economically recovered. We are prepared to guarantee the operation of our equipment; it will pay big dividends.

**SPECIAL PROBLEMS**

The above refer to more or less standard products, but there are always special problems, such as the refining of ethyl and amyl acetate, fusel oil, ethyl nitrite, etc., problems connected with the recovery of alcohol in solutions of different concentration, of mixtures of such products as acetone and alcohol; mixtures of acetone and butyl alcohol, of benzol and alcohol, etc. The experience required to permit such design and gained in the operation of such equipment should be invaluable to the prospective still purchasers.

**DISTILLING UNDER VACUUM AND UNDER PRESSURE**

The outlines above have referred principally to standard distilling equipment operating under atmospheric pressure, although some of the units, such as those for phenol, aniline oil, etc., operate under a vacuum. This brings up another feature of distilling work not generally appreciated; that is, the advantages at times of operating under Pressure or Vacuum.

**DISTILLING UNDER VACUUM**

Operating under vacuum permits lowering the boiling point of the product handled, and therefore permits operation with lower pressure steam; furthermore it permits operating at a temperature at which decomposition often does not occur, or is very much less than a higher temperature. In the case of such decomposition furthermore the chemical action on the materials of the still may be very much decreased on account of a lower rate of chemical action, as well as decomposition under a vacuum.

There is an additional advantage in case of vacuum distillation of a lower steam consumption under certain conditions. This applies, for instance, in the removal of one volatile material from another material in which it is in solution, where open steam is used as a distilling agent. Such a problem is involved in the removal of benzol from wash oil used in absorbing from coal gas.

The steam economy here is practically 80%, due not only to change in vapor pressure relations, but also to the fact that the materials handled do not have to be heated to as high a temperature, with consequent decrease in corrosion as well.

*Continued on Next Page*

**STILLS—Continued**

An advantage in distillation under a vacuum, not always appreciated, is in the fact that in the case of leakage all leaks are inward, and the danger caused through such leaks or loss by same can be avoided.

**DISTILLING UNDER PRESSURE**

Distillation under pressure cannot be employed as often as distillation under a vacuum, but in certain cases may have decided advantages, such as when removing a very volatile material from a solution where the volatile material boils at a temperature below that at which cooling water is available.

By operating such stills under pressure the boiling point of the volatile materials is raised, so that it may be condensed and collected under pressure, with water as a cooling agent, with an enormous economy, where brine might otherwise be required.

Such a problem exists in the case of distillation of acetaldehyde from solutions in water, of ethyl nitrite from solutions in alcohol, etc.

**BADGER SERVICE IN STILL CONSTRUCTION**

Outside of the general design of Stills as concerns particularly the arrangement and proportion of the parts, **Badger Stills** possess special features, such as perforated Boiling Cap construction, liquid flow and feed regulators, pressure regulators, etc., possessed by no other apparatus.



**CENTRALIZED CONTROL FOR DISTILLING EQUIPMENT**

We construct practically all our apparatus in our own shops with expert workmen, and under the supervision of men who have been in the metal working business for 50 years.

We have constructed Stills during the past few years of cast iron and steel, copper and aluminum, lead and silver lined, etc. On account of large amount of work which we have done, we have plans and patterns covering practically any size and design of apparatus, and we therefore specialize in making prompt and quick shipments.

**SOLVENT RECOVERY AND ABSORPTION EQUIPMENT GENERAL**

The great development in the chemical industry and the increasing high price of solvents have made the question of proper solvent recovery a very important one. There are furthermore many processes where extraction with volatile solvent can be employed to great advantage. We have had a great deal of experience in handling problems of this kind.

**VAPOR PRESSURES**

The laws of vapor pressure which govern practically all recovery operations of this type are little understood in their commercial application. By scientific study of the problems involved we have been able to effect enormous economies in operation and obtain recoveries which were not previously considered possible.

**CHOICE OF PROCESS**

Solvent extraction and absorption can be employed in the place of compression and distillation. The former usually has the advantage of offering opportunity for a practically complete recovery,

whereas compression methods usually permit only at the best a fairly complete recovery. Very often an absorption equipment of proper design will make unnecessary the installation of refrigerating machinery, with an enormous economy in cost. We are familiar with the entire field, and can advise clients properly with regard to process and equipment.

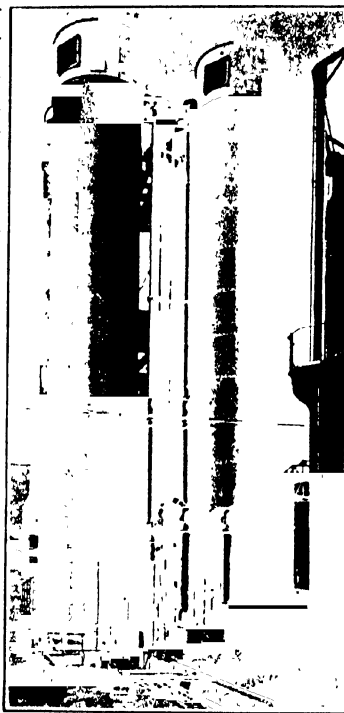
**SPECIAL PROBLEMS**

In order to illustrate where absorption and solvent recovery equipment can be used to advantage, we would mention a few specific cases.

**Acetaldehyde**—In process recently developed for the manufacture of acetic acid, the efficient absorption of acetaldehyde from air and gas has been of great importance. This is a problem which we have solved, and the successful working out of the process made unnecessary the use of refrigerating plant otherwise required, which would have cost not less than \$100,000.

**Ethyl Nitrite**—The recovery of this material from gas from a particular manufacturing plant illustrates the advantages of expert knowledge and careful design. It is also an example of absorption of material insoluble in water or in other solvent, such as, in this case, alcohol.

**Phenol**—In many cases solvent extraction can take the place of distillation with considerable economy, and the production of higher quality product. The



**BENZOL ABSORPTION TOWERS**

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**SOLVENT RECOVERY—Continued**

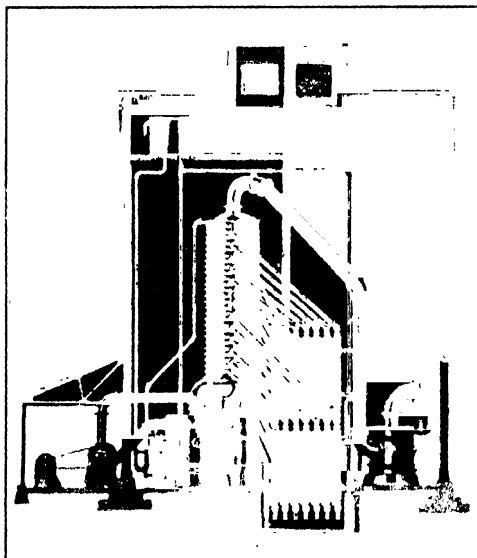
production of carbolic acid from coal tar distillate, a problem of this kind, has been successfully solved.



**SOLVENT RECOVERY, DISTILLATION EQUIPMENT**

**Ammonia**—The application of our special design of distilling and scrubbing columns to the production of pure ammonia gas has been productive of very satisfactory results.

**Acetone**—The application of our cap plate water or brine cooled absorption system to the recovery of acetone and alcohol employed in the manufacture of cordite not only gives exceedingly high recovery, but permits the obtaining of a concentrated solution which can be distilled with great economy.



**SCRUBBING TOWERS FOR SOLVENT RECOVERY**

**Benzol**—The recovery of benzol from coal gas by absorption and subsequent distillation is very important at the present time. We have developed special forms of vacuum and gas heated stills, as well as absorption towers, which are exceedingly efficient and economical.

The above refers to the removal of benzol from coal gas. There is furthermore a very large field for the recovery of benzol, gasoline, etc., where employed for solvent purposes. Probably the largest application is in plants for the impregnation of fabric with rubber or

**SOLVENT RECOVERY—Continued**

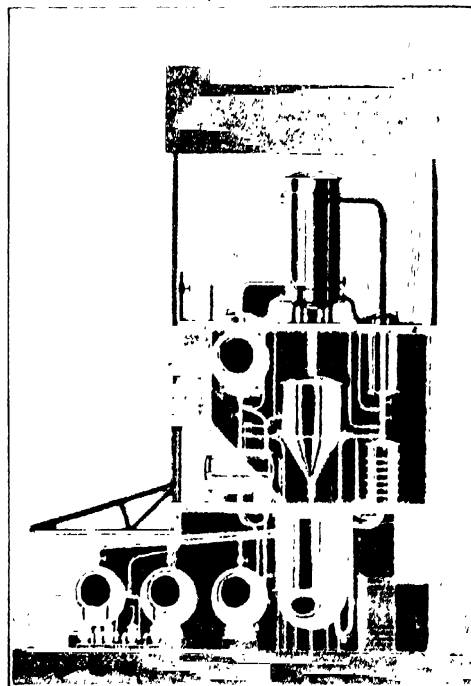
rubber compounds, as in the manufacture of cord tires. At the present prices some of the larger concerns can affect an economy of approximately one million dollars per year through the recovery of these products. We have designed very complete systems for this work.

**Ether**—The recovery of ether in the manufacture of smokeless powder by absorption and suitable solvent requires long experience and efficient apparatus. We have given a great deal of study to this problem.

**Miscellaneous**—Solvent extraction and recovery equipment, however, can also be employed to advantage for the recovery of gums and resins from filtering materials; of asphalts from scrap; of fats and greases from residue; or from liquor, such as wool scouring liquors. Such problems are of interest to the leather manufacturers, manufacturers of asphalt products, woolen mills, chewing gum producers, etc. In each case the problem requires special attention.

**Apparatus**—The apparatus is as important as the general system, and involves many special features, such as **Webre** air cooler and heater, **Badger** cap type scrubbing towers and continuous coolers.

One feature of the design of solvent recovery equipment must be especially carefully considered. We find that many manufacturers consider absorption as being a practically instantaneous combination of solvent and solute, quite comparable to an ordinary chemical reaction or to the condensation of steam by cool water. As a result of absorption, equipment is usually designed without particular respect to length of contact or countercurrent stage principles or to the maintenance of low temperatures so long as all particles of solvent and solute come into contact. This is entirely wrong. In each particular case the design must be determined dependent upon heats of vaporization, boiling points, concentrations, etc., and the problem is a very complicated one if efficiency is to be obtained.



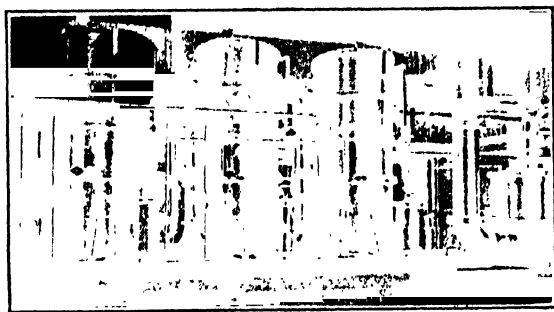
**SOLVENT EXTRACTION PLANT**

*Continued on Next Page*

## EVAPORATORS

In many chemical projects it very often happens that one of the most important links in the chain of operations is the evaporator problem.

The most annoying features of such problems are their apparent simplicity. It is only after one has met with failure that one realizes the importance of this subject and the attention it deserves, for not only must the process be carried on successfully, but it must also be carried on economically, if the project in



TRIPLE EFFECT EVAPORATOR FOR LOGWOOD EXTRACTS

question is to be commercially remunerative. This involves studies, not only of the general behavior of the solutions in question, but also heat studies properly correlated with not only chemical and physical characteristics, but also local plant conditions, water supply and cost of fuel.

Equipped as we are with an unusually capable staff of experienced engineers, we submit all propositions regarding installations to a very careful analysis, and our success in solving very difficult problems in the past has been due to this thorough study from both the theoretical and practical standpoints.

In our endeavor to build equipment adapted to various chemical and physical conditions we have evolved a number of designs which cover, in a general way, practically all ordinary problems. We find ourselves in a position, therefore, to build equipments for practically any purpose, such as

Sugar	Glucose
Salt	Glue
Glycerine	Gelatine
Potash	Black Liquor
Tanning Extracts	Sulphite Waste
Dye-wood Extracts	Calcium and Magnesium
Sulphates	Chlorides
Caustic Soda	Pyroligneous Acid
Sodium	Calcium Acetate
Benzo-sulphonate	Sodium and Potassium Ni-
Ammonium Phosphate	trates
Urea	Mercerizing Liquors
Water	Garbage Water
Tomato Pulp	Distillery Waste, etc.

## TYPES OF APPARATUS

### THE WEBRE STANDARD EFFECT

This equipment is in common use for the majority of simple solutions. It is a vertical tube apparatus provided with positive and uniform steam and liquor circulation, thoroughly vented and drained. It is built in singles, doubles, triples, quadruples, quintuples and sextuples and can be supplied in all sizes from 25 sq. ft. per body to 9,000 sq. ft. per body or even larger, if

## EVAPORATORS—Continued

necessary. One such equipment is now being built in quintuple effect containing 45,000 sq. ft.



QUADRUPE EFFECT EVAPORATOR HANDLING ACID LIQUORS

### HIGH SPEED EVAPORATOR

This is a long tube apparatus and is especially adapted to foamy organic materials, particularly if these are subject to injury by long contact with heating surfaces. It has been used with signal success in concentrating milk and photographic gelatine. It has also been used very successfully on distillery slop and pyroligneous acid. It is foam proof and entrainment proof. A careful series of tests have shown that the entrainment losses do not exceed 1/50 of 1%.

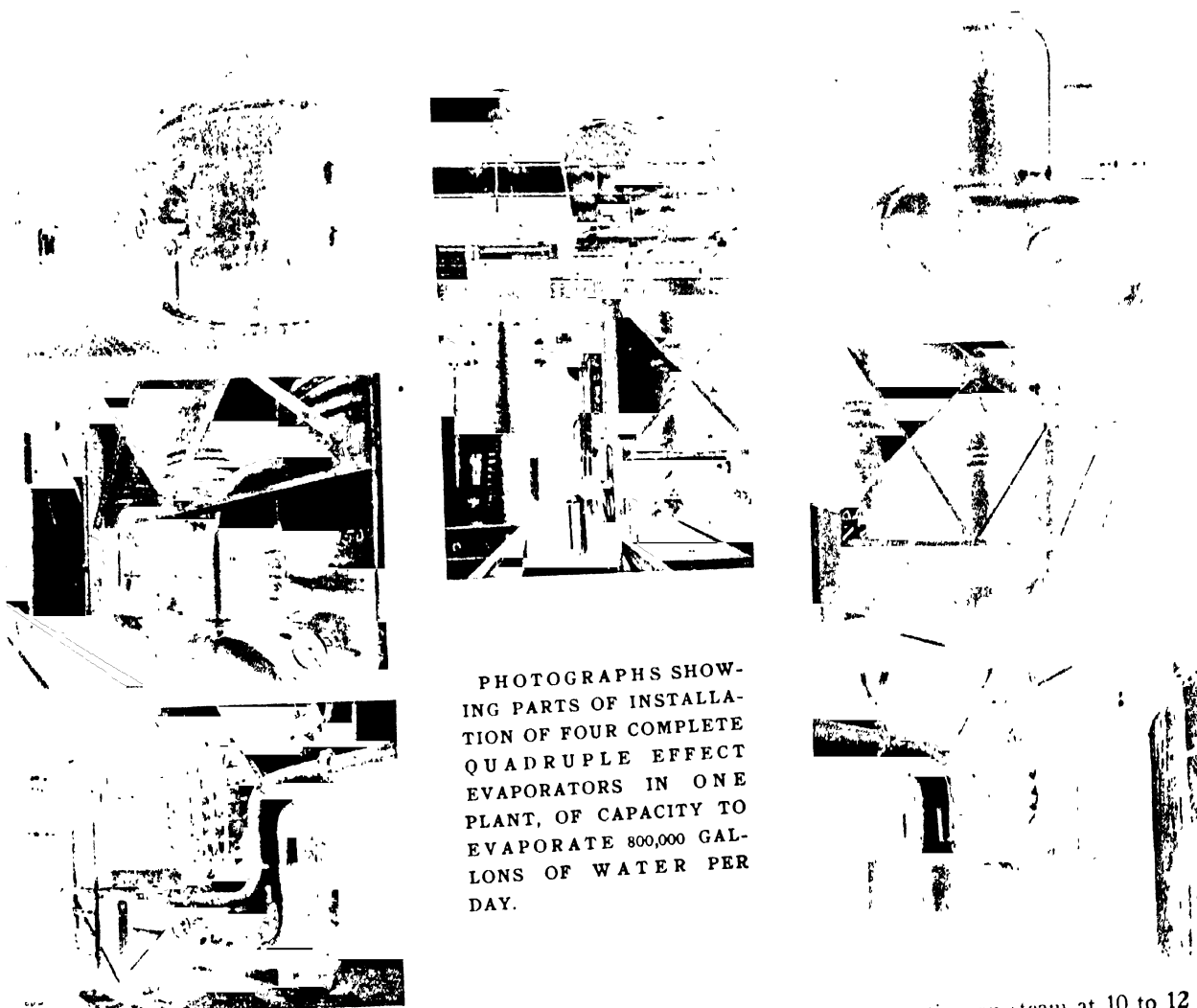
The equipment is provided with circulation controls in which the amount of liquor actually circulating can be adjusted to any desired amount. It is very easy to operate. At one plant, one operator takes care of three quadruple effects with ease.

The amount of liquor contained in the equipment is very small and therefore the time exposure to heat is correspondingly small. The coefficient of heat transmission is very high, permitting the use of low temperature drop where this is advisable. In one case we are operating the first body of a quadruple effect with 5 lbs. steam pressure on the steam side, maintaining from 2 to 3 lbs. on the vapor side, even when the rate of evaporation is very high. The steam side is thoroughly vented of all non-condensable or corrosive gases, eliminating the possibility of air binding or corrosion on the steam side, if these gases contain injurious materials.



QUADRUPE EFFECT FOR ACID LIQUORS—ANOTHER VIEW

*Continued on Next Page*



PHOTOGRAPHS SHOWING PARTS OF INSTALLATION OF FOUR COMPLETE QUADRUPE EFFECT EVAPORATORS IN ONE PLANT, OF CAPACITY TO EVAPORATE 800,000 GALLONS OF WATER PER DAY.

### CRYSTALLIZING EVAPORATORS

Not only have we built many equipments for crystallizing solutions, but we have been called on to make extensive investigations and carry on development work along these lines. We have three types of crystallizing evaporators which fulfil practically any but the most unusual requirements.

### DISTILLED WATER EVAPORATOR

We are in a position to furnish distilled water equipment for make-up in power plants, ice factories or any other purposes for which there is a need. Here also we find that it is best to study local conditions carefully with a view toward securing the best result. Our selection of type of evaporator and cycle of operation will be governed by individual requirements. For instance, in different plants, one of the following combinations would be most useful:

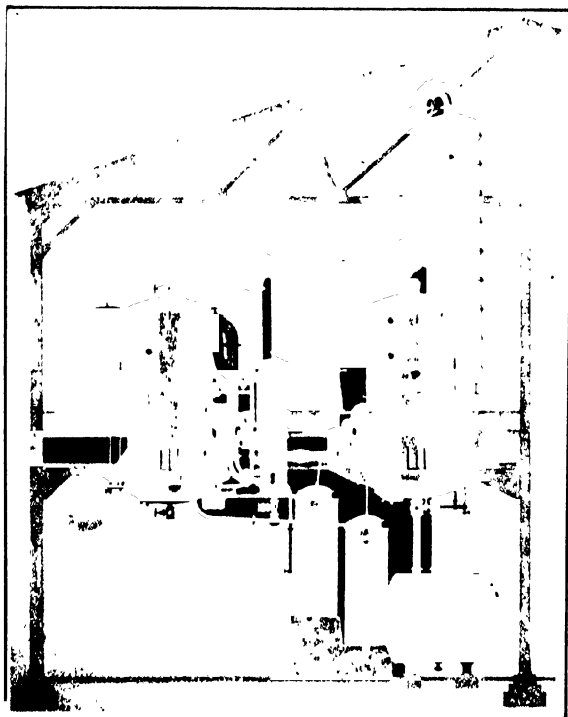
1. A multiple effect operating entirely on live steam and discharging vapors from the last body at a back pressure of 15 to 20 lbs.

2. A multiple effect operating on steam at 10 to 12 lbs. pressure and discharging vapors from the last body at atmospheric pressure.
3. Multiple effect operating on steam at low exhaust pressure and discharging vapors into the condenser at relatively high vacuum.
4. A multiple effect operating on steam at 15 to 20" of vacuum, and discharging vapors into a condenser carrying 26 to 27" vacuum.
5. A single effect operating under any of the above conditions.
6. A single effect operating on a low drop of 10 to 15°F. at any specified zone of temperatures.
7. A good illustration of special problems along this line would be a triple effect producing distilled water for make-up in a power plant, operating with exhaust from the auxiliaries at 0 lbs. pressure, provided with a small surface condenser and using for circulating water, the con-

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**EVAPORATORS—Continued**

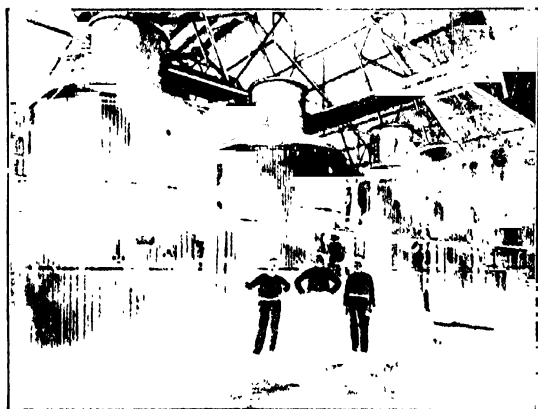
densate from the large surface condensers. Here, of course, it is necessary to study and balance all plant conditions so that the apparatus will fulfil the requirements economically.



**EVAPORATOR FOR ACETATE OF LIME AND PYROLIGNEOUS ACID**

**SPECIAL WORK**

Where unusual problems present themselves, we can undertake careful studies and analyses of these conditions and carry on experimental development work, if necessary, with a view to future construction to fulfil the requirements imposed.



**BADGER-WEBRE EVAPORATOR SEXTUPLE EFFECT**

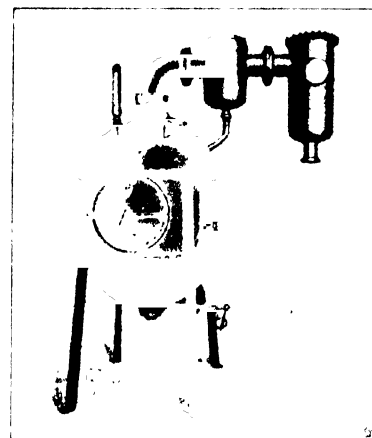
**VACUUM PANS**

We make a specialty of the manufacture of Vacuum Pans of iron, copper, lead, silver or tin-lined, copper or steel.

These pans may be fitted with our special manholes, foot valves, sight-glasses, thermometer and liquor testing attachments, catch-all, spray or surface condensers and vacuum pumps and are specially designed for handling milk, dyes, tanning, fruit and medicinal extracts, confectionery, etc.

We have recently made installations of special tin-lined vacuum pans for the concentration of urea. We have designed special equipments for the recovery of distilled solvents which have great advantages over equipment previously employed.

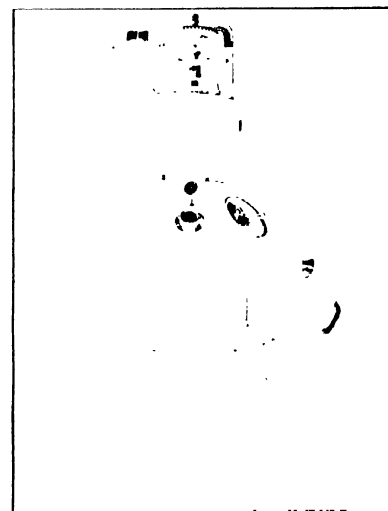
They are built in any capacity from 25 to 1500 gallons or larger.



**VACUUM PAN**



**SPECIAL VACUUM PAN**



**VACUUM PAN FOR FOOD PRODUCT**

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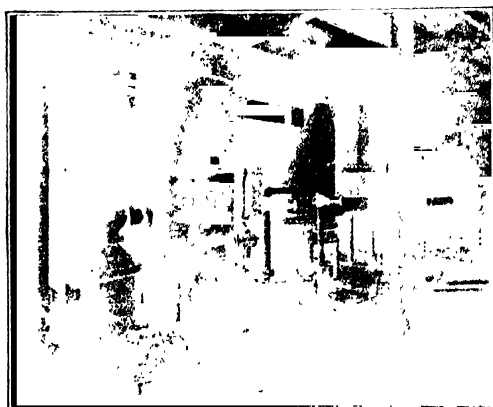
**DEALCOHOLIZING PLANTS**

As stated under the heading "Industrial Alcohol Plants," there is a large demand at the present time for equipment for the removal of alcohol from products such as wine, beer, patent medicines, etc. In most cases the object is not only to produce a substantially alcohol-free product of a saleable nature, but also to recover industrial alcohol of a high degree of purity. The requirements of equipment of this type are as follows —

- 1—The material must be subjected to the action of heat for a very short time.
- 2—The temperature must be maintained at as low a point as possible.
- 3—Practically all of the materials are of a foamy nature. Equipment must be designed to handle this type of material.
- 4—The operation should, if possible, be continuous.
- 5—The alcohol should be removed in most cases at as high a concentration as is reasonably possible. This prevents in most cases the removal of various flavoring materials.
- 6—The apparatus must be constructed of material which will not injure the product.

We have designed as a result of our experience and extended experiments a type of machine which is admirably suited to accomplish the above results. We have made installations for handling beer, wines, extracts and medicines.

In our process the material is introduced continuously into the machine, where it is heated in a thin film for a period of approximately two minutes, the alcohol being removed at a concentration of 10% to 50%, depending on the alcoholic content of the particular product. One very detrimental feature of substantially every other system for dealcoholizing work lies in the fact that the material is brought into contact with the heating surface, which is of necessity at a considerably higher temperature than the product itself.

**SEPARATOR****CONDENSER****DEALCOHOLIZING PLANTS—Continued**

In our system the heating is accomplished by means of pure distilled water vapor at a temperature which is the same as that of the material which is being dealcoholized. In this way the material comes in contact with no heating surface whatever, and is therefore much less affected by heat than otherwise.

**HEATER**

**Refining Equipment**—The alcohol removed (low wines) must be further treated to obtain a commercial product. The main part of the equipment required for concentrating and purifying the low wines resulting from the dealcoholizing of beer and other liquors is the distilling or rectifying equipment. There are three general types of stills which can be employed for this purpose — (1) Discontinuous Still, (2) 2-Column Continuous Still, (3) 4-Column Continuous Still.

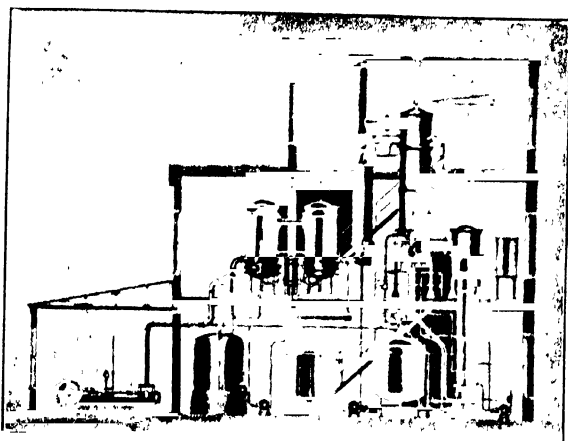
Discontinuous stills possess many disadvantages. In addition to their inability to produce pure alcohol, except through repeated operations, they require large storage capacity for low wines, intermediate products, etc. They have a large steam consumption, approximately 50 to 60 lbs. of steam per gallon of alcohol. They also require larger building space in view of tank requirements and necessitate very intelligent supervision. Consequently discontinuous stills are only recommended for small capacities where the amount of alcohol recovered is never greater than 200 gallons per day and where the weekly production falls off considerably during the major portion of the year.

**Badger-Barbet continuous stills** can be applied with advantage to the work of rectifying alcohol (low wines) from dealcoholizing plants.

**DISTILLING COLUMN****CONTINUOUS STILLS**

Continuous stills operate, as the name indicates, in a continuous manner, the low wines being charged into them continuously and the product removed in the same manner. For details see under Industrial Alcohol Plants on page 313.

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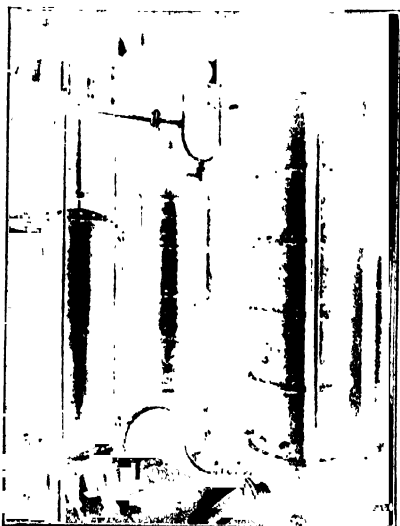
**EXTRACTION PLANTS****EXTRACTION AND CONCENTRATION PLANT****OIL EXTRACTION OR DEGREASING PLANTS**

The increasing shortage of fats and oils, and the necessity of recovery of gums, resins, etc., and of the purification of oily and greasy residues, have required extensive development of this industry. We specialize in the design of economical machinery for the direct extraction of oil from crushed seeds, grease from bones, tannage, press cakes, etc.

The design of such equipment varies greatly according to the nature of the material handled. In some cases stationary extractors are satisfactory; in other cases the use of rotary extractors is essential.

The chemical extraction of many materials, furthermore, requires the use of battery extractors in order to obtain complete extraction, and also a high concentration of the extracted material in solvent. Since the solvent extraction problem always involves the recovery of the solvent by distillation, it is evident that our extended experience in distillation lines should enable us to furnish very efficient equipment for this work.

In a recent installation we were able, through redesign of the distillation equipment which it was in-

**SPECIAL COLUMNS FOR EXTRACTION PLANT**

tended to install, to cut down the first cost of equipment about 40 per cent., and to cut down the steam and water requirement to 25 per cent. of that which would have been necessary under the original design.

Among the primary requirements for an extraction apparatus, outside of heat and solvent economy, are simplicity of design and operation, safety from fire when using inflammable solvents, etc.

It is evident from the above that each extraction problem should be very carefully considered.

**EXTRACTION FROM SOLUTIONS**

The production of various synthetic products requires the extraction of materials from solution by the use of immiscible solvents. We have devised special apparatus for this work. We have furthermore developed a solvent extraction process which in some cases can replace distillation methods, with a great economy in operation.

**DETAIL OF EXTRACTION PLANT****LOGWOOD AND TANNING EXTRACTS**

We furnish single and battery stage extractors for this work, either of wood, copper or steel. The advantages and economy of battery extraction are well known, but it is essential that the equipment be properly designed. We have specialized for many years in the manufacture of heavy copper work, and the manufacture of extraction equipment in nine cases out of ten involves careful construction along these lines.

**EXTRACTION OF FOOD PRODUCTS**

The production of extracts, such as coffee and tea, is becoming more and more important. We have recently designed, after extended experimentation, a system of extraction for coffee, for instance, which represents a great improvement over processes used by large concerns for years. We are able to secure much more complete extraction, with great economy in steam and water requirements for subsequent evaporation.

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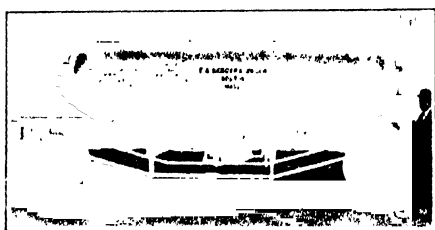
**AUTOCLAVES AND DIGESTERS**

We make a specialty of the manufacture of heavy copper or lead-lined digesters or autoclaves, diffusion batteries, etc.

At the present time the Auto-Saponification of fats for the production of high grade glycerine and fatty acids for distillation is attracting considerable attention in this country and we are equipped to furnish the necessary equipment complete.

The extraction of tanning extracts under pressure is another field in which there will be great improvements. We construct diffusion batteries of most efficient types for this work.

The production of many dyes and synthetic products requires the use of Autoclaves of steel and copper, and lead and silver lined, sometimes for very high pressures. Our long experience in this line, which necessitates expert knowledge, careful construction, and the best of material, together with our patented lining processes, fit us particularly for this work.



COPPER DIGESTER



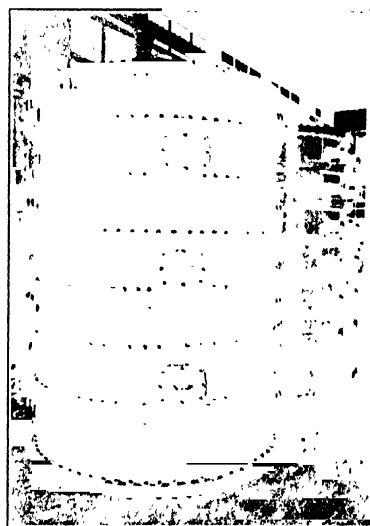
LEAD-LINED AUTOCLAVE



LEAD-LINED DIGESTER

**HOMOGENEOUS SILVER- AND LEAD-LINED COPPER AND STEEL APPARATUS**

For many years we have been successful manufacturers of homogeneous silver- and lead-lined copper



LEAD-LINED PURIFYING COLUMN

and steel apparatus. We have recently developed a process of homogeneous tin lining which has proven very satisfactory. We have found that many concerns have uses for equipment of this nature, but are not aware that the same is manufactured in this country. The equipment indicated on cuts herewith has been manufactured by us recently. Other installations made during the past few years cover lead-lined kettles, stills and digesters, silver-lined kettles and autoclaves, tin-lined stills, kettles, evaporators, tin-covered coils, etc.

So far as we know, no other concern possesses the facilities for manufacturing this type of equipment, nor the expert workmen required to carry out the work.

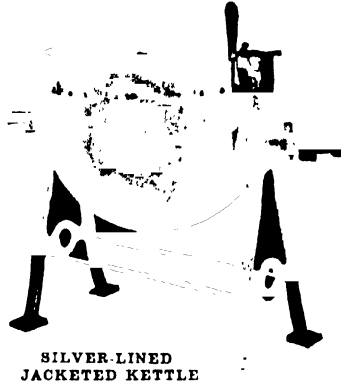


TIN LINED KETTLE

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### SPECIAL APPARATUS

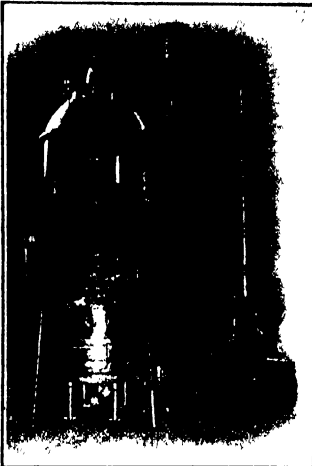
It is often necessary to construct special equipment, some of which we refer to in previous paragraphs, where we are referring particularly to the lining process itself. Such equipment comprises, for instance, Scrubbers, Mixing Stills, drying equipment, etc.



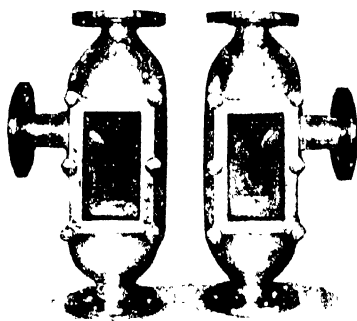
SILVER-LINED  
JACKETED KETTLE

We have solved a great many problems involving such apparatus.

We might refer to our silver-lined digesters, copper-lined autoclaves, tin-lined evaporators, apparatus for ether extraction from water solutions, lead-lined steam jacketed scrubbing towers, etc., as examples of such special equipment. Problems of this kind involve careful and expert design and chemical engineering experience, as well as most expert construction.



CRYSTALLIZING EVAPORATOR



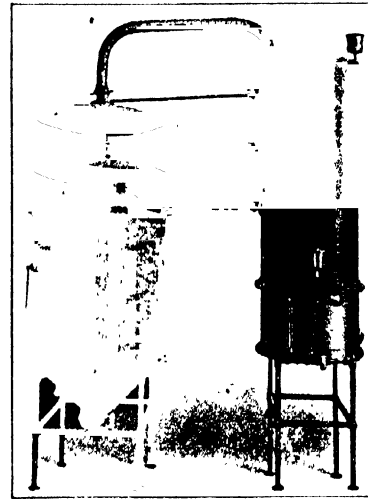
SOLID SILVER SIGHT BOXES

In the course of designing and erecting complete plants we have often had to devise new special valves, fittings, measuring devices, automatic control equipment, gauges, meters, etc., in order to exactly meet requirements for which no standard equipment already on the market would be suitable. Our plant is

completely equipped to attend to such details, which contribute in no small degree to the success of our installations.

### EXPERIMENTAL WORK

It is obvious that the design of our own equipment requires experimental work, often on a considerable scale. We often carry on operations on a small plan or miniature industrial scale in our own shops or laboratories, however, for our customer's benefit.



SPECIAL STILL

Inasmuch as our returns are obtained through the sale of machinery and equipment, we ordinarily make no charges for this work, even though it may involve processes with which we are not concerned.

We shall be pleased to consider inquiries requiring such work. It will be evident that we have exceptional facilities for adapting equipment in our shops to any work on hand.



STEAM-JACKETED MIXING STILL

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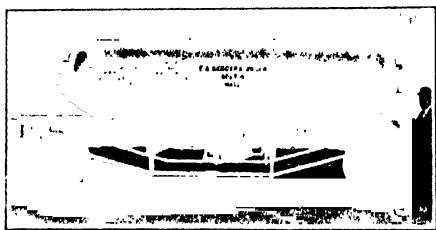
**AUTOCLAVES AND DIGESTERS**

We make a specialty of the manufacture of heavy copper or lead-lined digesters or autoclaves, diffusion batteries, etc.

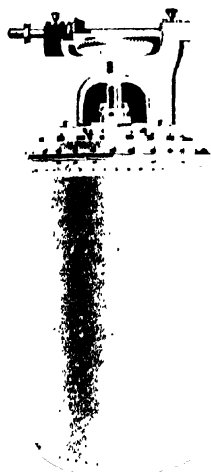
At the present time the Auto-Saponification of fats for the production of high grade glycerine and fatty acids for distillation is attracting considerable attention in this country and we are equipped to furnish the necessary equipment complete.

The extraction of tanning extracts under pressure is another field in which there will be great improvements. We construct diffusion batteries of most efficient types for this work.

The production of many dyes and synthetic products requires the use of Autoclaves of steel and copper, and lead and silver lined, sometimes for very high pressures. Our long experience in this line, which necessitates expert knowledge, careful construction, and the best of material, together with our patented lining processes, fit us particularly for this work.



COPPER DIGESTER



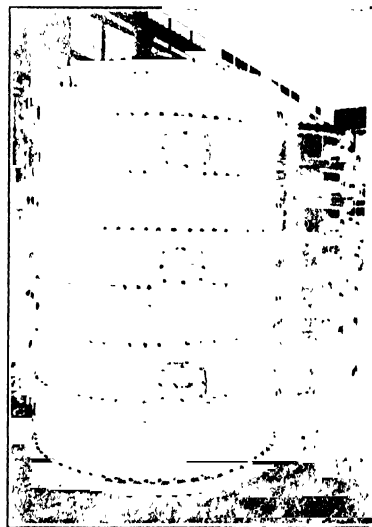
LEAD-LINED AUTOCLAVE



LEAD-LINED DIGESTER

**HOMOGENEOUS SILVER- AND LEAD-LINED COPPER AND STEEL APPARATUS**

For many years we have been successful manufacturers of homogeneous silver- and lead-lined copper



LEAD-LINED PURIFYING COLUMN

and steel apparatus. We have recently developed a process of homogeneous tin lining which has proven very satisfactory. We have found that many concerns have uses for equipment of this nature, but are not aware that the same is manufactured in this country. The equipment indicated on cuts herewith has been manufactured by us recently. Other installations made during the past few years cover lead-lined kettles, stills and digesters, silver-lined kettles and autoclaves, tin-lined stills, kettles, evaporators, tin-covered coils, etc.

So far as we know, no other concern possesses the facilities for manufacturing this type of equipment, nor the expert workmen required to carry out the work.



TIN LINED KETTLE

*Continued on Next Page*

# E. B. BADGER & SONS COMPANY

BOSTON, MASS., U. S. A.

NEW YORK OFFICE 101 Park Avenue

CHICAGO OFFICE 8 So. Dearborn Street

## PRODUCTS (SPRAY)

Water Cooling Systems; Air Washers; Air Conditioning Apparatus; Air Coolers; Smoke Washers; Odor Condensers; Gas Scrubbers; Humidifiers; Spray, Sewage and Aerating Nozzles; Spray equipment for acid plants.

## USES FOR SPRAYING EQUIPMENT

Cooling water for condensers, stills, etc., to afford 28" vacuum or better.

Cooling liquids and spraying brine for refrigerating plants.

Cooling, spraying and washing oils.

Spray system for sulphuric acid plants.

Evaporating or densifying liquids by spraying at moderate temperature, resulting in fuel economy.

Spray plants for atomizing purposes.

Spray washers for scrubbing gases.

Dust precipitation and collection.

Aerating and purifying water supplies.

Condensing and absorbing odors and vapors.

Washing and humidifying air.

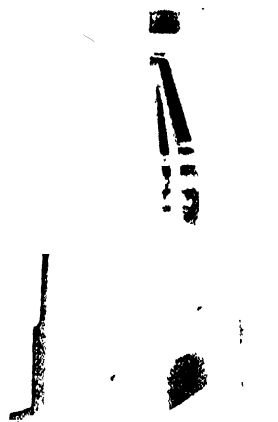
Cleaning blast furnace gases.

Reclaiming gasoline, etc.

Removing studs from paper machines.

## SPRAY NOZZLES

Our nozzles operate on the centrifugal principle, as extensive experience with all types of nozzles has shown it to be the simplest and most efficient means to atomize water. An examination of our nozzles will show it consists of two parts: a shell and a stationary turbine center that produces the centrifugal effect. The vanes in the center are very carefully made so as to gradually change the direction of flow and thus avoid the formation of eddy currents. The water passages are large and

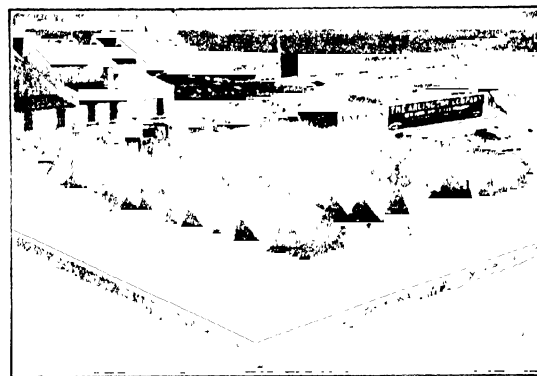


CONSTRUCTION SPRAY NOZZLE

## SIZES AND CAPACITIES

Size of Nozzle	Diam. of Orifice	Diam. of Supply	Capacity in gallons per minute at various pressures—Lbs. per square inch					
			6	8	10	15	20	30
No. 2	1/32"	1/2"	0.43	0.5	0.55	0.68	0.79	0.96
No. 3	1/16"	3/8"	1.77	2.4	2.28	2.8	3.22	3.95
No. 4	1/32"	1/2"	41	48	535	65	75	93
No. 5	1/8"	3/4"	75	86	96	1.16	1.34	1.64
No. 6	1/16"	1/2"	1.79	2.06	2.3	2.82	3.26	4
No. 7	1/8"	3/4"	3.44	3.97	4.45	5.45	6.3	7.7
No. 8	5/16"	1"	5.6	6.5	7.2	8.8	10.2	12.5
No. 9	3/8"	1 1/4"	8.3	9.5	10.7	13	15	18.5
No. 10	1/2"	1 1/2"	15.5	17.8	19.9	24.4	28	34.5
No. 11	5/8"	1 3/4"	21.7	28.2	32	39	45	55
No. 12	3/4"	2"	36.4	42	47	57.5	66.5	81
No. 13	7/8"	2 1/2"	50	58	64.5	79	81	112
No. 14	1"	3"	60	76	85	105	120.00	148
No. 15	1 1/4"	3 1/2"	105	122	135	165	190	254

short, preventing clogging, and resulting in a highly efficient type of nozzle. The nozzles are usually made of composition, but any suitable material can be used where corrosive liquids have to be sprayed.



INSTALLATION COOLING 5000 GALLONS PER MINUTE  
Arlington Plant, E. I. du Pont de Nemours & Co.

## COOLING WATER

Our spray equipment is well adapted to cool water economically and efficiently. The cooling range varies with the humidity. In moist climate it usually approximates 20° F., but in hot, dry localities it may be as much as 30° F. or 40° F. The minimum limit to which water can be cooled is to within a few degrees of the wet bulb temperature. The cost of our spray system is much less than a cooling tower of same capacity, while the maintenance and operating expense is about one-half as much. The cooling range is somewhat greater. Where ground space is limited the sprays can be installed on the roof or if a natural pond is available they can be installed over same. In most cases an earthen pond will be satisfactory but we have standard designs in concrete that can be economically constructed.

**Water Loss**—This seldom exceeds 2% of the volume of water sprayed. It includes the loss from evaporation and drift. The latter loss is negligible. The yearly average loss will approximate only 1% and winter loss only 1/2%.

**Spray Parts**—Our engineers having developed group spraying, spray arms, spray heads, and spray tees, all of which are now standard practise, we are prepared to furnish promptly nozzles or any other parts that are interchangeable with existing spray systems. It will pay you to get our quotations on same.

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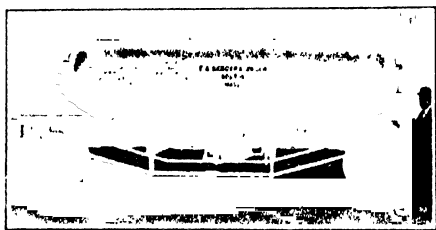
**AUTOCLAVES AND DIGESTERS**

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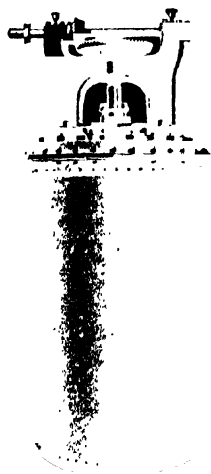
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COPPER DIGESTER



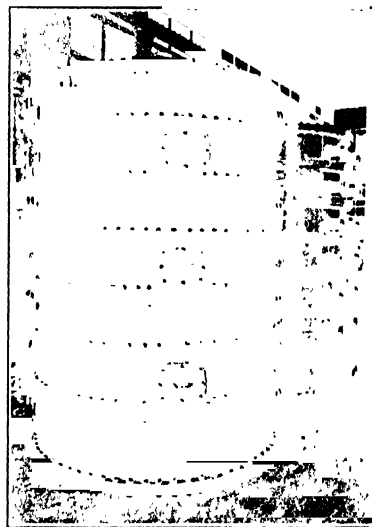
LEAD-LINED AUTOCLAVE



LEAD-LINED DIGESTER

**HOMOGENEOUS SILVER- AND LEAD-LINED COPPER AND STEEL APPARATUS**

For many years we have been successful manufacturers of homogeneous silver- and lead-lined copper



LEAD-LINED PURIFYING COLUMN

and steel apparatus. We have recently developed a process of homogeneous tin lining which has proven very satisfactory. We have found that many concerns have uses for equipment of this nature, but are not aware that the same is manufactured in this country. The equipment indicated on cuts herewith has been manufactured by us recently. Other installations made during the past few years cover lead-lined kettles, stills and digesters, silver-lined kettles and autoclaves, tin-lined stills, kettles, evaporators, tin-covered coils, etc.

So far as we know, no other concern possesses the facilities for manufacturing this type of equipment, nor the expert workmen required to carry out the work.



TIN LINED KETTLE

*Continued on Next Page*

# BAKER & CO., INC.

NEWARK, N. J.

NEW YORK OFFICE  
30 Church Street

CHICAGO OFFICE  
5 South Wabash Avenue

## PRODUCTS

Platinum Laboratory Apparatus, including: Crucibles; Combustion Apparatus; Dishes; Pans; Triangles; Filter Cones; Filter Crucibles; Gooch Form; Electrolytic Separation Apparatus; Spoons; Tweezers; Stirring-Rods; Tongs; Platinum Wire, Sheet, Sponge, Salts and Solutions; Platinum ware repaired.

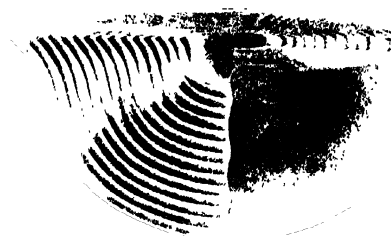


FIG. 6

## BAKER PLATINUM WARE

Only specially refined Platinum is used in "Baker" laboratory ware.

Each piece of Platinum apparatus is tested by us before shipping, and is guaranteed to be free from flaws, blisters or other defects of material or workmanship.

Old crucibles, dishes and appliances of all forms reshaped, repaired, purchased or exchanged for new ware.

Our catalog "Data Concerning Platinum" will be sent on request.

## PLATINUM DISHES, WITH OR WITHOUT LIPS

Round Bottom--Hammered and Guaranteed

Capacity in C. C.	Approximate Weight in Grammes	Diameter Cm	Depth Cm
15	5	3.8	1.0
20	6	4.2	2.0
25	8	4.4	2.2
35	12	4.8	2.4
50	17	5.6	2.7
65	22	6.5	3.0
75	25	6.5	3.3
100	31	7.2	3.5
125	42	7.8	3.7
150	50	8.4	3.7
175	55	8.9	4.1
200	67	9.4	4.3
250	80	9.8	4.5
300	94	10.1	4.8
350	117	11.1	5.0
400	133	11.5	5.4

## PLATINUM CRUCIBLES, WITH OR WITHOUT COVERS

Hammered and Guaranteed


	Capacity in C. C.	Approximate Weight in Grammes	Diameter and Depth in Cm
	8	8	2.2
	10	10	2.5
	15	15	3.0
	20	20	3.3
	25	25	3.5
	30	30	4.0
	40	40	4.2
	50	50	4.4
	60	62	4.7
	70	65	5.0
	80	68	5.3
	90	70	5.4
	100	80	5.6
	110	90	5.7

FIG. 4

10 C. C. to 90 C. C. Inclusive

Covers are always furnished with crucibles unless otherwise ordered. Crucibles of other weights and capacities made to order. Gold, silver and gold lined platinum crucibles made to order.

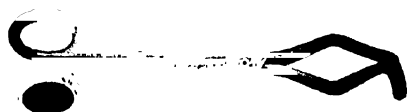
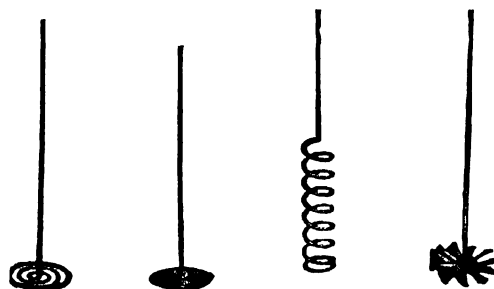


FIG. 35—CRUCIBLE TONGS



Nickel plated, with hollow platinum tips



## PLATINUM ANODES FOR ELECTROLYTIC SEPARATIONS

Fig. 54	Fig. 55	Fig. 56	Fig. 98
Diam $\frac{3}{4}$ in.	Diam $\frac{3}{4}$ in.	Diam $\frac{3}{4}$ in.	Diam 1 in.
Height $4\frac{1}{2}$ in.	Height 4 in.	Height $6\frac{1}{2}$ in.	Height 4 in.
Weight 7 gms	Weight 5 gms	Weight 7 gms.	Weight 6 gms

## PLATINUM GAUZE ELECTRODES

Fig. 93	52 mesh to 1 inch Weight 6 grams	45 mesh to 1 inch Weight 14 grams	Fig. 92
			
			In
			Diam of Cylinder . . . . . 1
			Height of Cylinder . . . . . 2
			Height of Stem . . . . . 2
			Height, Over All . . . . . 4
			Diam of Stem . . . . . 0.40

# JOSEPH BAKER SONS & PERKINS CO., INC.

Sole Sales Agents for

Werner & Pfleiderer Machinery and  
Appliances Used in the Chemical, Pharmaceutical,  
Food and Allied Industries

27 WEST 43RD STREET, NEW YORK, N. Y.



GENERAL OFFICES  
White Plains, N. Y.

FACTORIES  
Saginaw Mich

## PRODUCTS

"Universal" Kneading and Mixing Machines for all purposes; Automatic Sifting, Blending, Conveying and Weighing Plants for Flour, Powdered Sugar, Carbon Flour and materials of similar consistency; Baking and Drying Ovens; Hydraulic and Screw Presses for extrusion of plastic masses, etc.; Rapid Dissolvers for China Clay, Kaolin, Salts, etc.; Rubber Cement, Compounding, Masticating and Washing Machines; Vacuum Mixing Machines; Complete installations for the manufacture of Bread, Biscuit and Wafers, Macaroni, Noodles, Chocolate and Candy, Automatic Traveling Ovens.

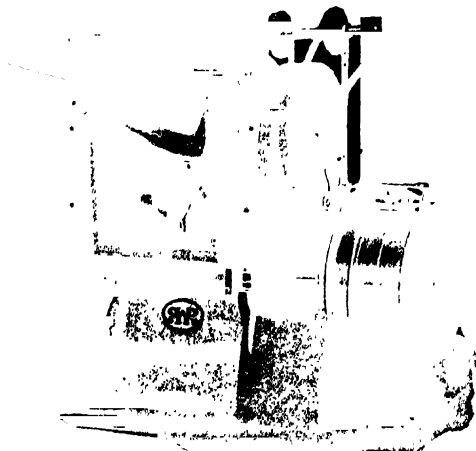
In addition to the data given on this page, more extensive information regarding our equipment and its uses may be found on pages of this publication under the caption **Werner & Pfleiderer Company.**

## SIZES AND STRENGTHS

The great range in sizes of "Universal" Kneading and Mixing Machines, from  $\frac{1}{4}$  gallon up to 2650 gallons, covers the most diversified requirements. Full assurance of filling your exact needs obtains in the fact that each size of "Universal" is built in various strengths, excepting only the smaller of the laboratory machines.

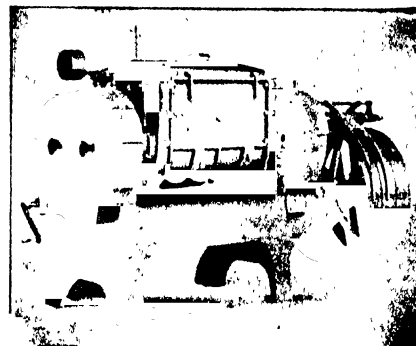
## TEMPERATURE CONTROL AND SPECIAL FEATURES

All sizes of our mixers may be jacketed for either heating or cooling, fitted with various styles of covers, and equipped with easily renewable special metal linings and special metal mixing blades for resistance to abrasion or corrosion. Serrated saddle in the mixing trough and serrated removable shoes for the blades can be supplied to effect a pulping or shredding action.



SIZE 14, TYPE VII, CLASS BB

Cast Iron Trough with Serrated Saddle, Blades with Serrated Shoes, and Vaulted, Counterbalanced Cover. (Tilted Position.)



SIZE 14, TYPE V, CLASS BB

Cast Iron Trough, Vaulted Counterbalanced Air tight Cover Working Position

From our wide experience in this phase of the chemical and food industries, we can undoubtedly give you valuable assistance on problems that may have previously defied mechanical handling.

## RAPID DISSOLVER

A simple yet efficient machine for the rapid and energetic dissolving or distribution in suspension of earths or chemicals, soluble or insoluble, operating with a minimum of power.



RAPID DISSOLVER, SIZE 1

Built in sizes from  $2\frac{1}{4}$  gallons up to 1250 gallons

# BALTIMORE COPPERSMITH CO.

Manufacturers of  
Copper Chemical Equipment  
1914 Aliceanna Street  
BALTIMORE, MD.

## PRODUCTS

Coppersmithing for Chemical Engineers and all kinds of Industrial Chemical Plants, including:

Coils of all kinds	Jacketed Kettles
Condensers	Agitator Kettles
Distilling Equipment	Varnish Kettles
Extracting Apparatus	Vacuum Pans
Dye House Apparatus	Jacketed Pans
Copper Tanks	Still
Heaters	Stirrers
Coolers	Ladles
Boilers	Steam Tables for Dyers,
Yeast Plant	and Finishers, Etc.

## EXPERIENCE

We have been for years in the Coppersmithing business, during which time we have successfully made a large variety of equipment for:

Dyers	Chemists
Bleacheries	Confectioners
Textile Finishing Plants	Silk Printers
Varnish Makers	Laboratories
Distillers	Yeast Plant Equipment

The workmanship of our equipment is of the very best, and we believe that our prices are unequalled for similar workmanship and quality of material. We wish, however, to draw special attention to our facilities for handling special work in accordance with the designs of engineers and chemists.

## FACILITIES

Our plant is modern and well equipped, and located at Baltimore, Md., which is conveniently near the largest manufacturing districts of the East. We have access to all the principal railroad systems, and can also ship by water to points on the Atlantic seaboard, and elsewhere. These facilities enable us to make prompt and economical deliveries of even the largest equipment.

## SPECIAL CONSTRUCTION

We can build any equipment that falls within the scope of a coppersmithing establishment.

Chemical engineers and factory managers can submit drawings to us and we will be pleased to estimate on them. In many cases we can submit suggestions with regard to the building of such equipment based on our long experience in fabricating equipment from copper. In brief, we will cooperate with the designer and buyer of the equipment in an intelligent and mutually helpful manner.

## STEAM JACKETED KETTLES, STATIONARY

These kettles are made of heavy copper, strongly

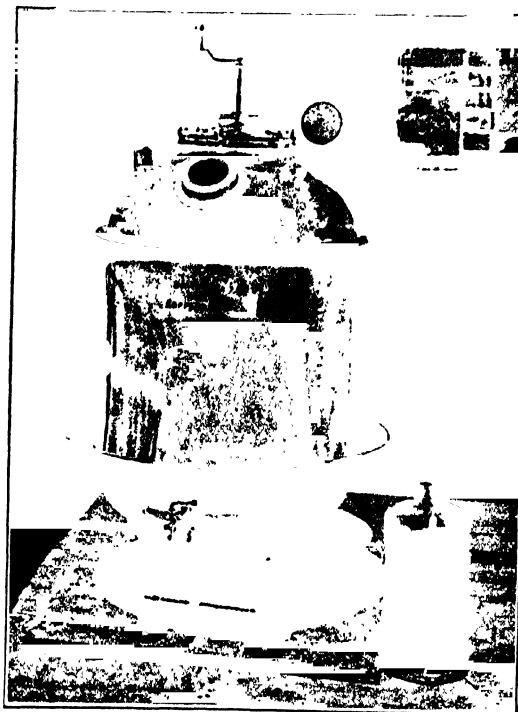
hammered and well riveted. They have a frame of iron as shown in the cut, and ample steam space to insure even and rapid boiling. Made from 5 gallons to 600 gallons' capacity, and tested before leaving our works.

## STEAM JACKETED TILTING KETTLE

Made in the same manner and of the same material as the steam-jacketed stationary kettles. Made in all sizes up to 70 gallons. Guaranteed in every respect.

## DYE KETTLES

Made in sizes from five gallons up. Can be carried around plant. Are supported by a heavy iron rig at bottom. Can be supplied tin lined if desired.



YEAST CULTURE KETTLE

## VACUUM PANS, LABORATORY SIZE

The capacities of these pans range from 10 to 20 gallons.

The small laboratory sizes are supplied with legs and are built for hard service. These are complete in every detail of construction, when compared to the larger types used for manufacturing, and can be supplied with or without agitator, and equipment for belt or motor drive. The style of our vacuum pans in regard to the hand-hole near the bottom makes the interior easy of access for observation or discharge.

# BARNSTEAD STILL AND STERILIZER CO.

BOSTON, 30 MASS., U. S. A.

## PRODUCTS

Water Distilling Apparatus.  
Alcohol Recoverers.  
Sterilizing Equipment.

### TYPE "C," COMMERCIAL STILL

This still, recommended for continuous operation, is designed for use where high pressure steam, from 60 to 150 pounds, is available for heating.

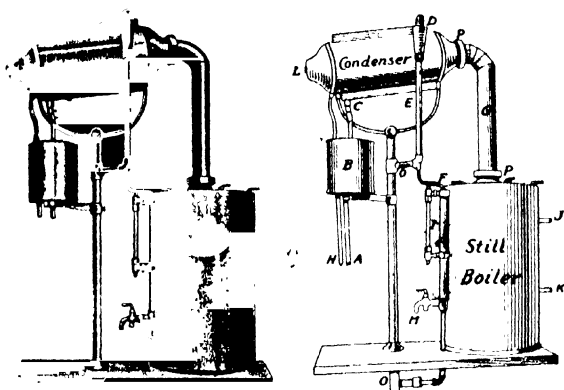
It is made of heavy copper and composition, and thoroughly coated with pure block tin on all parts that come in contact with the water. Finished outside in white nickel with galvanized casings.

The heating coil, easily detachable for cleaning, is an annular coil of government composition, preferable to copper as it requires less space because of a much greater heating surface.

Adaptable for the requirements of large laboratories, bottlers, manufacturing chemists, soap manufacturers, ice plants and textile mills.

Once the still is started, the heat generated in the boiler pre-heats the incoming raw water thereby reducing the amount of live steam required for heating.

The operation is effective, automatic and continuous. All gaseous and organic impurities are removed and the water is made chemically pure.



COMMERCIAL STEAM STILL

No.	Capacity Gal. per Hr.	Space Required			Price upon application
		Length	Width	Height	
0 A	1	..	..	..	
00	2	..	..	..	
0	5 to 7	..	..	..	
1	10 to 15	36	12	42	
2	15 to 20	48	18	54	
2 1/2	20 to 25	50	23	58	
3	25 to 30	60	30	69	
4	30	66	30	78	
5	75	72	34	86	
6	100	76	38	90	
7	200	..	..	..	
8	500	..	..	..	
9	1000	..	..	..	

**Operation** The water to be purified is supplied by pipe A and passing through cooler B enters the condenser at C, circulating around the condenser tubes becomes heated to boiling and is discharged into an open connection at D, where the ammoniacal and other gases are thrown off. The water thus purified passes down pipe F. A sufficient quantity enters the still boiler at E, is made into steam, the surplus condensing water flows to waste through overflow pipe O, a continuous stream running while operating still.

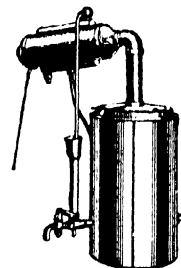
The steam being raised to a temperature sufficiently high to destroy all germ life, thence passing up steam pipe G to the condenser, is there condensed, the distillate flowing through a block-tin coil in the cooler B is discharged at H, chemically pure.

The water entering the cooler B cools the distillate and absorbing the units of heat becomes heated as it passes to the condenser and to the boiler. The heat for operating the still is by steam applied by connection with a steam boiler at J, the steam passing through annular coils and returned to the boiler through pipe connected at K.

To clean the still boiler, remove clamps PP, steam pipe G, and cover. The interior is accessible, the water and sediment being drawn off at cock M. When operating allow a little steam to issue from vent L, at end of condenser, thus preventing absorption of impurities from the atmosphere. The quantity of steam that issues from said vent is governed by the cold water admitted through supply pipe A.

### TYPE "L" LABORATORY STILL

This type is especially recommended for continuous operation, as required in most laboratories, and for manufacturing purposes; also for intermittent operation. The Stills are substantially built of heavy copper, nickel plated. All parts that come in contact with the water are thoroughly coated with pure block tin, and are most easily cleaned.



TYPE "L" LABORATORY STILL

Capacities from 1 to 10 gal. per hour, gas heated; electrically heated—1 to 20 gal. per hour.

**Gas Heated**—It is equipped with Radiant Burner incased under the boiler, which reduces the heat loss to a minimum. The boilers are so constructed that they present the greatest possible heating surface so that they are as near 100% efficient as is possible to make and which accounts for the great economy of fuel.

**Electrically Heated**—Those electrically heated are equipped with an immersion type G-E helical heating unit, applied by a patented method which gives 100% efficiency, so that this type of Still is very economical. The heating units are so arranged in the boiler that they are surrounded with the water, thereby reducing the heat loss to a minimum. The units will last indefinitely if kept covered with water, they are, however, easily replaceable in case of need. This can be attended to by the operator without the necessity of returning the Still to the factory for repair. This is one of the exclusive features of the Barnstead Electric Still.

### BARNSTEAD ALCOHOL RECOVERER

This apparatus consists of a boiler and receiver made of composition in the form of a jacket-kettle with an inlet and outlet for steam and return steam; likewise a large opening in the bottom for a draw-off valve.

# BARRY-WEHMILLER MACHINERY CO.

Manufacturers of  
Bottle Soaking and Pasteurizing Machinery  
SAINT LOUIS, MO.

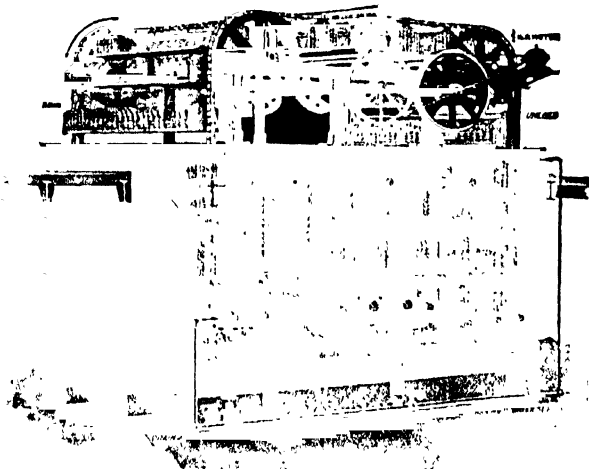
NEW YORK OFFICE  
210 Fifth Ave.

## PRODUCTS

Pasteurizing Machines  
Bottle Soaking Machines  
Bottle Cleaning Machines  
Labeling Machines  
"Carryall" Conveyors

## PASTEURIZERS

Pasteurization as accomplished by our machine consists in gradually heating the bottles to the required temperature, maintaining it for a definite period and finally cooling the bottles in the shortest possible time to a temperature below the "danger" point. The latter feature is now recognized to be fully as important as maintaining the maximum temperature for the proper time; since the tremendously rapid multiplication of bacteria at from 95 to 110°F. demand that the liquid after passing through the maximum heat shall be cooled below these dangerous temperatures with the greatest rapidity and shall in every case be finished by the machine at not exceeding 85°F.



ONE OF OUR TYPES OF PASTEURIZING MACHINES

## BRUSHING MACHINE FOR CLEANING AND POLISHING OUTSIDE OF BOTTLES BEFORE OR AFTER FILLING

This machine equipped with device at discharge end for receiving the polished bottles and setting them up vertically in position to be removed by operator or to be deposited automatically on a chain belt carrying them to the next machine.

Built in four sizes: 10, 15, 16 and 20 bottles wide.

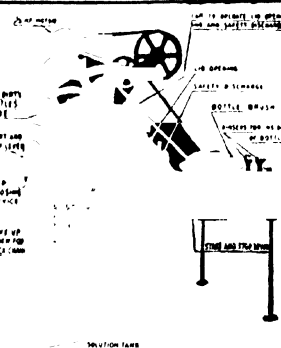
Will handle bottles from 6 to 32-ounce capacity—80 to 225 bottles per minute.



BOTTLE BRUSHING MACHINE

## COMMON SENSE BOTTLE SOAKER

We build this machine in two general types, one type for handling pint, eight-ounce, half-pint, and quarter-pint bottles, and another type for handling quart, pint, and half-pint bottles. We build each type in three different capacities.



COMMON SENSE BOTTLE SOAKER

Each will handle within its own range

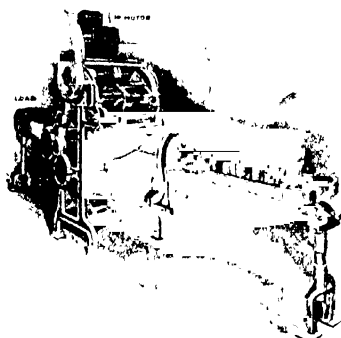
at one time or at different times mixed lot of bottles.

Either the Soaker or the Brush can be stopped from either end of the machine and one independently from the other.

One of these machines has been in use for two years by the Mallinckrodt Chemical Co. of St. Louis, and one has been installed by Lehn & Fink in their New Jersey factory.

We also make multiple compartment soakers up to 12000 bottles hourly capacity, and eight compartments giving repeated submerging and draining of bottles, with or without automatically connected inside and outside washers with brushes or with hydro-pressure for inside cleansing.

## AUTOMATIC HIGH SPEED LABELER



AUTOMATIC HIGH SPEED LABELER

Bottles from 6 to 32 oz. capacity.

Capacity from 60 to 105 bottles per minute.

Continuous Rotary motion.

Bottles placed on conveyor carrying to machine.

Bottles delivered in upright position to case packers.

No expert required to operate Machine.

Only  $\frac{1}{8}$  Horsepower actually required to operate.



# THE BARTLETT HAYWARD COMPANY

## Founders and Engineers

MAIN OFFICE AND WORKS  
BALTIMORE, MD.

NEW YORK, N. Y.

### PRODUCTS

Complete Plants for Coal and Water Gas, Coal Gas  
By-Products, Cane and Beet Sugar  
Special Equipment for Gas and By-Product Plants  
Special Gas Cleaning Apparatus  
White and Middleton Gas Engines.

### GAS MANUFACTURING PLANTS

We design and build complete plants for the manufacture of

Coal Gas  
Carburetted Water Gas  
Blue Water Gas

as well as **special equipment** for plants of any size

DeBrouwer Retort Charging and Discharging Machines  
Hot Coke Conveyors  
Condensers  
Tar Extractors  
Scrubbers  
Purifier Boxes  
Feld Vertical Centrifugal Scrubbers  
Gas Holders  
Steel Tanks  
Waste Heat Boilers  
Coke Screening Plants

### SPECIAL GAS CLEANING APPARATUS

We design and build special apparatus for cleaning the gas from

Blast Furnaces  
Gas Producers  
Lime Kilns

### CANE AND BEET SUGAR FACTORIES

Multiple Effect Evaporators  
Vacuum Pans  
Crystallizers

### WHITE & MIDDLETON GAS ENGINES

Horizontal Type—5 to 50 H. P.  
Vertical Type—50 H. P.

### BY-PRODUCT PLANTS

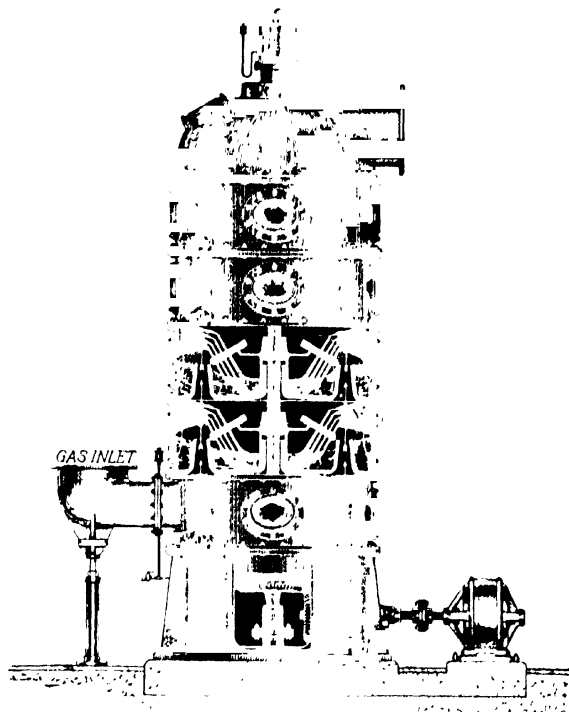
We design and build complete plants for the manufacture of

Concentrated Ammonia  
Aqua Ammonia  
Ammonium Sulphate  
and for the **recovery** of  
Tar  
Cyanogen

Benzol and other products  
as well as **special apparatus** for the

Production of Ammonium Sulphate without the use of Sulphuric Acid

Manufacture of Potassium Ferrocyanide and Sodium Ferrocyanide



BHCO FELD GAS SCRUBBER

### BHCo-FELD GAS SCRUBBERS

For removal of dust, soluble and insoluble fumes, recovery of volatile solvents and by-products

Scrubbers are built with diameter and number of sections to suit the requirements.

# BARRY-WEHMILLER MACHINERY CO.

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Bottle Soaking and Pasteurizing Machinery  
SAINT LOUIS, MO.

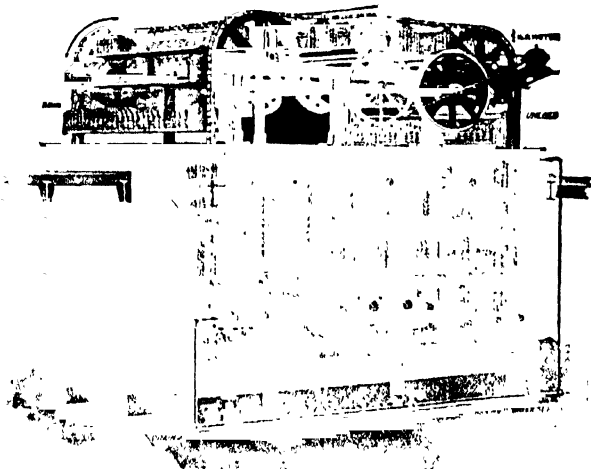
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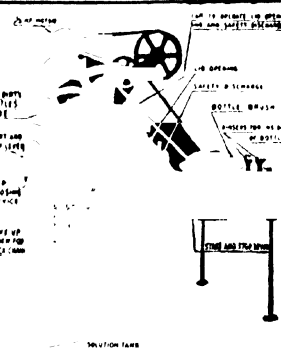
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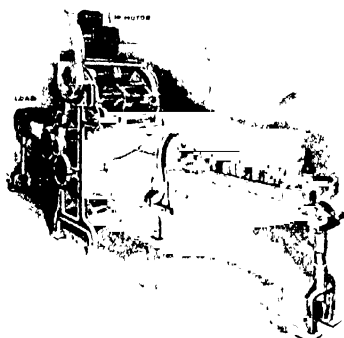
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We also make multiple compartment soakers up to 12000 bottles hourly capacity, and eight compartments giving repeated submerging and draining of bottles, with or without automatically connected inside and outside washers with brushes or with hydro-pressure for inside cleansing.

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No expert required to operate Machine.

Only  $\frac{1}{8}$  Horsepower actually required to operate.

# BAYLEY MANUFACTURING COMPANY

## Builders of Heating, Ventilating and Drying Apparatus

CHICAGO OFFICE:  
1156 First National Bank Building

732 Greenbush St.  
MILWAUKEE, WIS.

CLEVELAND OFFICE:  
826 Engineers Building

### PRODUCTS

**Plexiform Fans, Pressure Blowers, Fans for Forced and Induced Draft, Chinook Heaters, Steam Engines, Leather Driers, Shavings Exhaust Fans, Steam Traps, Blast Gates, Counter Shafts, Special Equipment for Handling Fumes in Chemical Plants.**

Literature on all these Bayley products will be supplied on request

### SERVICE

The Bayley Mfg. Co. has built Fans and Blowers for handling acid fumes for many of the largest plants in America, and its engineering staff is at all times prepared to submit plans and estimates for efficient equipment adapted to individual requirements

### PLEXIFORM FANS

The Plexiform Fan is of a distinctive and original design that combines great strength in construction with lightness and efficiency. Its characteristics and distinguishing features are:

Maximum air from minimum of housing

Large and practically unobstructed inlet and outlet openings

Free and noiseless delivery of air, without the use of arbitrary cut-offs

A type of construction adapted for handling high temperature as well as low temperature gases, and for double width, double inlet fans as well as single width, single inlet fans

Suitable for practically all applications where maximum volume of air (at low or medium pressures) is desired, and especially where space conditions limit and where horsepower expenditure is a prime factor.



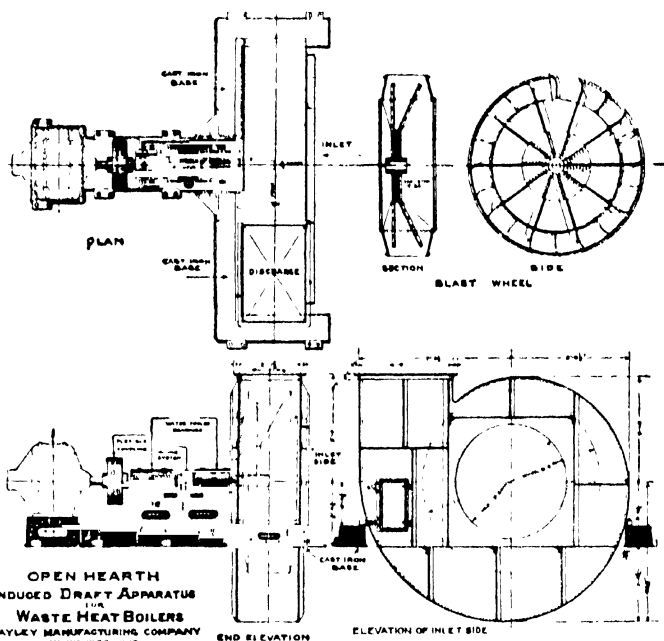
It is used generally as a component part of indirect systems of heating and ventilating for industrial buildings of all kinds; for forced and induced draft applications; for drying; for ventilating purposes, and for the handling of dust-laden air, etc.

### STEAM ENGINES

Vertical and horizontal steam engines for high and low pressures, built for direct connection to fans and generators and for belt connections.

### EXHAUST FANS FOR INDUCED DRAFT

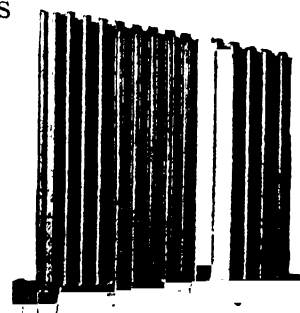
This figure illustrates a specially constructed steel plate exhaust fan built for induced draft purposes.



This is for handling large volumes of high temperature gases against high pressures. The fan is direct driven by an electric motor, through a flexible coupling. The blast wheel is overhung, the journals being on one side, the motor, the journals and the fan to be erected on a common sub-base making a self-contained unit.

### CHINOOK HEATERS

A staggered tube, indirect heater, built without the use of return bends, elbows, nipples or left-hand threads. The circulation is accomplished by the use of a pipe within a pipe. The Chinook heater cannot be racked out of shape by the ravages of unequal expansion and contraction, as each tube is independent of every other.



CHINOOK HEATER

It is used principally in connection with the Plexiform Fan for heating and ventilating public buildings and for drying. It is also used as indirect radiation independent of fans, for cooling water and for condensing exhaust steam.

It is shipped set up or knocked down, depending on size and installation conditions.

# BARRY-WEHMILLER MACHINERY CO.

Manufacturers of  
Bottle Soaking and Pasteurizing Machinery  
SAINT LOUIS, MO.

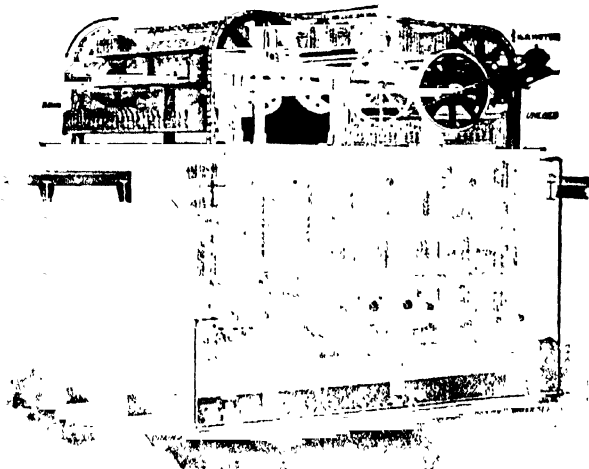
NEW YORK OFFICE  
210 Fifth Ave.

## PRODUCTS

Pasteurizing Machines  
Bottle Soaking Machines  
Bottle Cleaning Machines  
Labeling Machines  
"Carryall" Conveyors

## PASTEURIZERS

Pasteurization as accomplished by our machine consists in gradually heating the bottles to the required temperature, maintaining it for a definite period and finally cooling the bottles in the shortest possible time to a temperature below the "danger" point. The latter feature is now recognized to be fully as important as maintaining the maximum temperature for the proper time; since the tremendously rapid multiplication of bacteria at from 95 to 110°F. demand that the liquid after passing through the maximum heat shall be cooled below these dangerous temperatures with the greatest rapidity and shall in every case be finished by the machine at not exceeding 85°F.



ONE OF OUR TYPES OF PASTEURIZING MACHINES

## BRUSHING MACHINE FOR CLEANING AND POLISHING OUTSIDE OF BOTTLES BEFORE OR AFTER FILLING

This machine equipped with device at discharge end for receiving the polished bottles and setting them up vertically in position to be removed by operator or to be deposited automatically on a chain belt carrying them to the next machine.

Built in four sizes: 10, 15, 16 and 20 bottles wide.

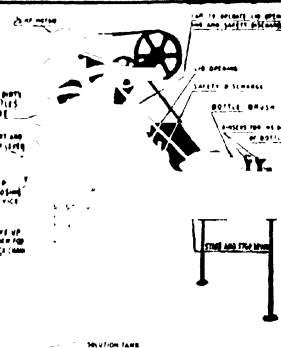
Will handle bottles from 6 to 32-ounce capacity—80 to 225 bottles per minute.



BOTTLE BRUSHING MACHINE

## COMMON SENSE BOTTLE SOAKER

We build this machine in two general types, one type for handling pint, eight-ounce, half-pint, and quarter-pint bottles, and another type for handling quart, pint, and half-pint bottles. We build each type in three different capacities.



COMMON SENSE BOTTLE SOAKER

Each will handle within its own range

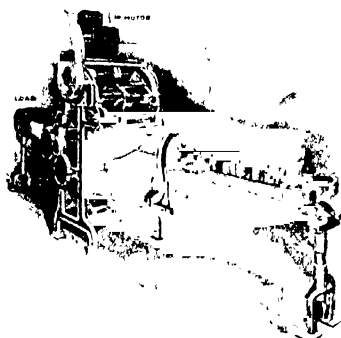
at one time or at different times mixed lot of bottles.

Either the Soaker or the Brush can be stopped from either end of the machine and one independently from the other.

One of these machines has been in use for two years by the Mallinckrodt Chemical Co. of St. Louis, and one has been installed by Lehn & Fink in their New Jersey factory.

We also make multiple compartment soakers up to 12000 bottles hourly capacity, and eight compartments giving repeated submerging and draining of bottles, with or without automatically connected inside and outside washers with brushes or with hydro-pressure for inside cleansing.

## AUTOMATIC HIGH SPEED LABELER



AUTOMATIC HIGH SPEED LABELER

Bottles from 6 to 32 oz. capacity.

Capacity from 60 to 105 bottles per minute.

Continuous Rotary motion.

Bottles placed on conveyor carrying to machine.

Bottles delivered in upright position to case packers.

No expert required to operate Machine.

Only  $\frac{1}{8}$  Horsepower actually required to operate.

fractive index is read directly from the graduated circle. The accuracy of reading is to about 2 units in the fourth decimal place. When white light is employed, the dispersion is neutralized by the Abbe Compensator, the mount of which is graduated, permitting measurements of mean dispersion.

#### CHEMICAL MICROSCOPE M



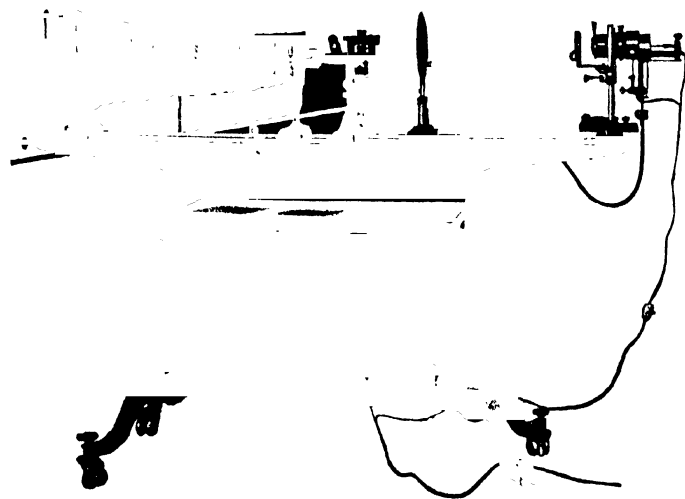
CHEMICAL  
MICROSCOPE M

This microscope is made after the design of Dr. E. M. Chamot, of the Department of Chemistry at Cornell University and author of "Elementary Chemical Microscopy." It is admirably adapted for the examination of foods and drugs, as well as chemicals; also, by the addition of an auxiliary stage, for a limited amount of metallurgical work. The complete outfit, with three objectives, affords a magnification of from 20 to 250 diameters. Write for descriptive circular.

#### METALLOGRAPHIC EQUIPMENT

While chemical analysis determines the chemical composition of a metal, it is only by the use of the microscope that the physical composition is determined. The microscope is the means of an absolute check on alloys; it can be used for observing changes in the physical composition brought about by variation in the kind and quantity of ingredients used in the manufacture, by heat treatment, rolling, strain, age and the like, all of which changes can be permanently recorded by means of metallographic apparatus.

Bausch & Lomb outfits are extremely rigid and have ample range of adjustment, making them very convenient to handle. The optical equipment is of the highest standard, illumination is under perfect control and the results obtained are clear and sharp. We have a model to fit the needs of every metallurgist.



GSA-119 METALLOGRAPHIC APPARATUS

The GSA-119 equipment, as illustrated, is recommended to those who wish to obtain an apparatus of unusual rigidity and mechanical accuracy, particularly where high magnifications are to be undertaken. While it is regularly provided with a floor stand, it can be supplied with the bed fitted with short, flat supports, for attaching to a laboratory table or embedding in a cement foundation, if such is desired. The complete equipment consists of the following: a cast iron supporting stand, of massive construction, with base spread of 54 x 24 in. and height of 42 in.; illuminating system with 5-ampere, 90°, hand feed arc lamp and rheostat for 110 volts; camera, which will accommodate plates up to 8 x 10-in., provided with all necessary accessories, and 11.25 inverted microscope, especially designed for use in this equipment.

#### APPARATUS FOR PHOTOMICROGRAPHY

The 11.25 camera, as illustrated, is so arranged that it may be used for photomicrography with transmitted light, using the regular laboratory or com-

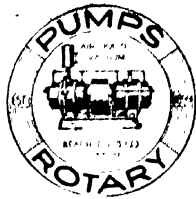


11.25 PHOTOMICROGRAPHIC APPARATUS

pound microscope either in a horizontal or vertical position; also for drawing by means of a reflecting mirror placed over the eyepiece. It is especially applicable for use in chemical or research laboratories, particularly in the paper and textile industries. The drawing board, adjustable on the front standard, is supplied with a velvet hood on adjustable standard to shield the board from light, when desired.

Supporting stand is of rigid construction, 39 in. high; illuminating system consists either of a 5-ampere, 90°, hand feed arc lamp with rheostat for 110 volts and aspheric condenser or a 6-volt Mazda lamp and transformer for 110 volts, A. C.; camera, fully equipped, will accommodate plates up to 5 x 7-in.

Write for literature or further information concerning our metallographic or photomicrographic outfits.



# BEACH-RUSS COMPANY

GENERAL OFFICES

HUDSON TERMINAL BUILDING

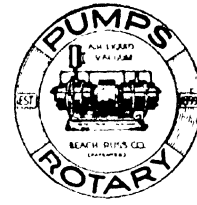
50F CHURCH STREET, NEW YORK, N. Y.

Chicago

Philadelphia

FACTORY Brooklyn, N. Y.

Telephone - CORTLAND 54-15-56  
Cable Address - "AIRBEACH", New York



## PRODUCTS

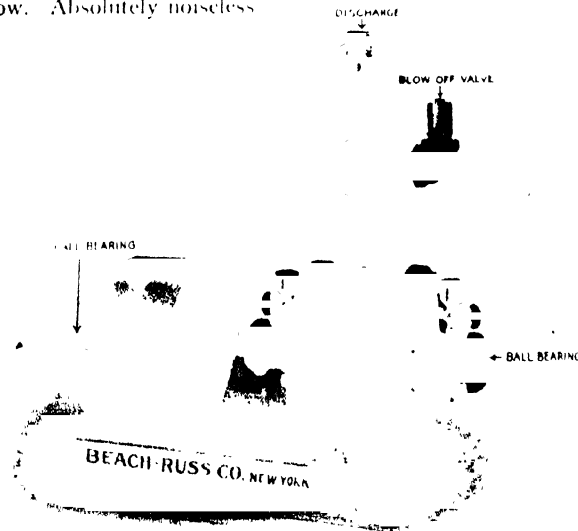
Rotary Air Compressors  
Vacuum Pumps  
Acid-Resisting Pumps  
Heavy Liquid Pumps  
High Vacuum Finishing Pumps  
Also Positive Pressure Blowers, Pumps for Heating  
Plants, and Filter Presses.

See Announcement in this volume of Abbe Engineering Company for:

Pulverizing Mills  
Rotary Cutters  
Disintegrators

## ROTARY AIR COMPRESSORS (Patented)

These compressors are for all purposes requiring air pressure—gas and oil furnaces, agitating liquids, atomizing, glass blowing, laundries, etc. They give a direct, non-pulsating supply of air without the use of air receivers of any kind up to 25 lbs. pressure. They have no complicated parts and are equipped with ball bearings throughout, making their power consumption low. Absolutely noiseless.



## ROTARY AIR COMPRESSOR

Patented

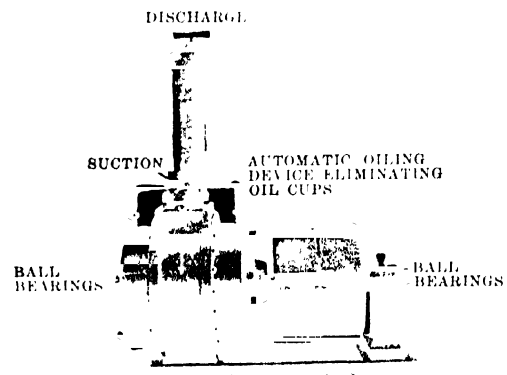
### SIZES AND CAPACITIES

Size No.	Speed R.P.M.	Capacity Cu. Ft. P.M.	H. P. at 5 lb. Press.	Pipe Size	Pulleys Inches	Weight Pounds	Floor Space Required
1	600	6	1/4	3/4	6 x 1	30	1' 1" x 6"
2	600	9	1/2	3/4	6 x 1	40	1' 4" x 6"
3	600	15	3/4	3/4	6 x 2	50	1' 6" x 6"
4	400	28	1 1/4	1	8 x 2	100	2' 0" x 10"
5	400	45	2	1 1/4	8 x 2	125	2' 2" x 10"
6	350	63	3	1 1/2	12 x 3	275	2' 6" x 1' 3"
7	300	97	5	2	16 x 4	600	4' 1" x 1' 6"
8	300	175	7	2	16 x 6	800	4' 5" x 1' 6"
9	300	263	8	4	18 x 6	1100	5' 0" x 1' 6"
10	250	500	15	8	20 x 8	2000	5' 6" x 2' 10"
11	225	730	30	10	22 x 8	2808	6' 0" x 3' 0"
12	200	1000	25	12	24 x 10	4000	8' 0" x 3' 2"

## SINGLE STAGE VACUUM PUMPS (Patented)

These pumps may be used for all purposes where a vacuum up to 29 in. (735 mm.) is required. They are built in the same capacities as the Beach-Russ rotary air compressors, and run noiselessly.

These pumps cost less than the Beach-Russ compound high duty vacuum pumps, but they equal the latter in construction, material and workmanship.



## SINGLE STAGE VACUUM PUMP

Patented

### SIZES AND CAPACITY OF SINGLE VACUUM PUMPS

Size No.	Cu. Ft. P.M.	Speed R.P.M.	H.P. Motor Vacuum 15" 27"	Outlet Inches	Size of Pulleys	Weight Pounds	Floor Space Required	
1	6	600	1 1/4	1 1/2	3/4	6 x 2	50	1' 3" x 6"
2	15	600	1 1/2	1 1/2	3/4	6 x 3	75	1' 6" x 6"
3	28	400	1 1/2	2 1/2	1	10 x 3	150	2' 0" x 10"
4	45	400	2	3	1 1/4	10 x 4	200	2' 2" x 10"
5	63	350	3	5	1 1/2	12 x 4	400	2' 6" x 1' 3"
6	75	300	3 1/4	5 1/2	1 1/2	16 x 4	450	2' 8" x 1' 3"
7	114	300	6	9	2	16 x 6	655	4' 1" x 1' 6"
8	175	300	7	11	2 1/2	18 x 6	1100	4' 5" x 1' 6"
9	263	300	8	12	6	18 x 8	1500	5' 0" x 1' 6"
10	500	250	15	30	8	22 x 8	2500	5' 6" x 2' 10"
11	730	225	20	35	10	24 x 10	3200	6' 0" x 3' 0"
12	1000	200	25	50	12	30 x 12	4000	8' 0" x 3' 2"

## COMPOUND HIGH DUTY VACUUM PUMPS

Guaranteed to exhaust to within 1/10 in. (2.5 mm.) of Barometer.

The Beach-Russ Company has been manufacturing patented rotary vacuum pumps for twenty-four years.

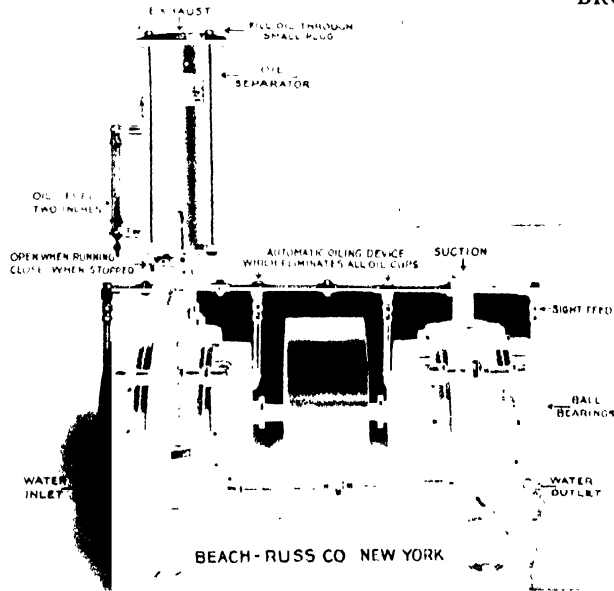
These pumps were awarded the gold medal at the Panama-Pacific Exposition. They are simple in construction and silent in operation, have no gears or complicated parts, take up little room and have low power consumption per unit volume of air displaced.

**Uses**—These pumps can be used to advantage in distilling, incandescent lamp exhausting, preserved food sealing, vacuum bottle manufacturing, vacuum heating, liquid transferring and many other operations. They are especially useful in laboratories.

The High Vacuum Pump mentioned above is not only obtainable in the small volume laboratory pumps, but also in large commercial sizes displacing hundreds of cubic feet of air per minute.

Continued on Next Page

**Lubrication**—These pumps are equipped with the Beach-Russ patented automatic oiling device, by means of which oil cups are eliminated and perfect lubrication of all parts is secured. Ball bearings are used throughout. Simple in construction, silent in operation.



**COMPOUND HIGH VACUUM PUMP**  
Patented

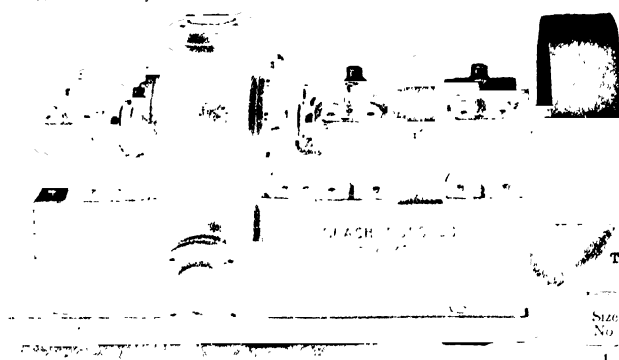
Guaranteed to produce a Vacuum within 1/19 inch of Barometer

**SIZE AND CAPACITY OF COMPOUND HIGH VACUUM PUMPS**  
WE ALSO MANUFACTURE LARGER SIZES

Size No.	Capacity Cu. Ft. P. M.	Speed R. P. M.	Outlet Inches	Weight Pounds	Horse Power	Pulleys Inches	Floor Space Required
1	6	600	3/4	165	3/4	8 x 2	1' 8" x 10"
2	9	600	3/4	200	1	8 x 2	1' 9" x 10"
3	15	600	1	225	1 1/2	8 x 2	2' 0" x 10"
4	28	400	1	375	2 1/2	10 x 3	2' 8" x 17 3/4"
5	45	400	1 1/2	495	3	10 x 3	2' 10" x 17 3/4"
6	65	250	1 1/2	600	5	16 x 6	3' 3" x 17 9"
7	87	250	2	1100	8 1/2	16 x 6	3' 6" x 17 9"
8	114	200	2 1/2	1500	9	18 x 6	5' 1" x 21 2"
9	175	200	3	2300	13	18 x 6	7' 0" x 21 0"
10	263	200	6	3250	18	18 x 8	8' 6" x 21 0"

### HEAVY LIQUID PUMPS

These pumps are designed for pumping coal tar products, oil greases, paints, varnish and other liquid of high viscosity.

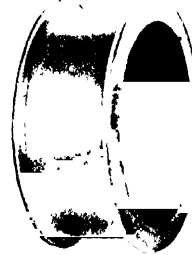


**HEAVY LIQUID PUMP**

They are of extra heavy construction and will stand all kinds of abuse.

They are built in five sizes with capacities from 50 to 500 gal. per minute.

### BRONZE GEAR PUMP



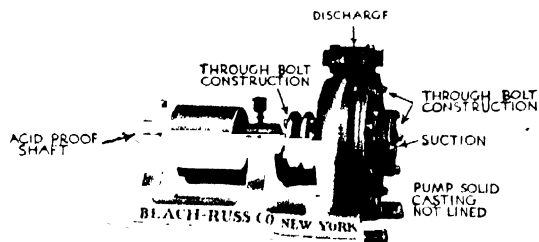
**BRONZE GEAR PUMP**

For pumping all kinds of liquids; Capacities 1 gallon to 50 gallons per minute up to 80 lbs. pressure or 170 foot head

### ACID RESISTING PUMPS

Our Acid Resisting Centrifugal pumps are constructed in hard lead, antimony alloy, monel metal, bronze and aluminum to suit various kinds of work. They are cast solid, not lined, making their period of service unlimited. Single Stage, Side Suction, open impeller type with through bolt construction which eliminates all chance of stripping threads by careless workmen.

These Pumps were designed in conjunction with the Government engineers for pumping both diluted and heavy solutions of sulphuric acid.



**ACID RESISTING PUMP**

The dimensions mentioned in the table below can also be obtained in brass, bronze or cast iron. We have manufactured acid resisting pumps for a number of years and our experience in this line enables us to offer the best pump of its kind on the market.

**TABLE OF BELT DRIVEN, ACID-RESISTING CENTRIFUGAL PUMPS**

Size No.	Section	Discharge	Cap. Gals. Per Min.	Pulley	Floor Space	Shipping Weight
1	1 1/2"	1 1/4"	20	4 x 3"	12 x 10	40
2	2"	1 1/2"	45	5 x 5"	21 x 13	100
3	3"	2"	90	6 x 6"	24 x 17	200
4	3"	2 1/2"	150	6 x 7"	26 x 20	290
5	4"	3"	200	7 x 7"	28 x 24	400

# CHRISTIAN BECKER, INC. TORSION BALANCE COMPANY

MAIN OFFICE

92 READE STREET, NEW YORK, N. Y.

FACTORY 147-151 Eighth Street, Jersey City, N. J.

BRANCH OFFICES

Chicago, Ill. 31 W. Lake Street

San Francisco, Cal. 49 California Street

## PRODUCTS

**Balances:** Analytical, Assay, Bullion, Jewelers, etc.

**Scales:** Laboratory, Pharmaceutical, Textile, Cream-Test, Grain, etc.

**Weights:** Metric, Avoirdupois, Troy.

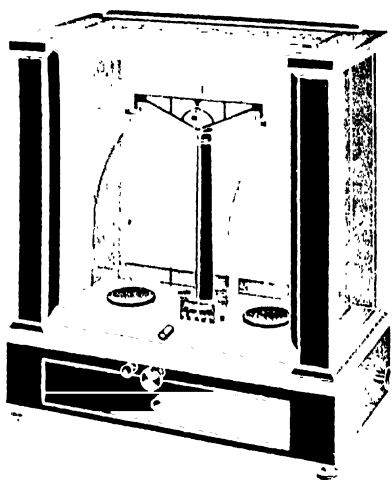
## ANALYTICAL "CHAINOMATIC" BALANCES

Riders and fractional weights up to 50 mg. eliminated.

Weighing in analytical chemistry completely revolutionized.

Thousands in use.

Endorsed by industrial chemists and educational workers everywhere.

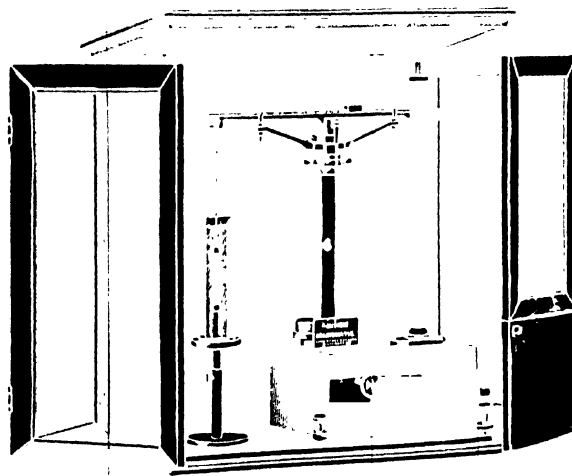


ANALYTICAL CHAINOMATIC BALANCE NO. 8-A

Direct readings are taken from the graduated scale and vernier, in itself a great time-saving feature, and reducing errors to a minimum, when compared with the customary method of using small fractional weights, etc.

**CHAINOMATIC**

Trade-Mark



## SPECIFIC GRAVITY CHAINOMATIC BALANCE FOR LIQUIDS

Graduated Scale Giving Direct Readings in Specific Gravity

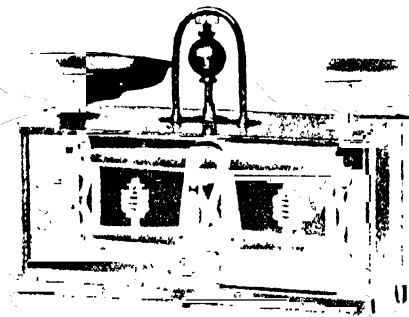
Simple, Rapid, Accurate, Scientific

Automatic in Principle - No Weights or Riders

No. 100 ranging to 2.0000, to fourth decimal place.

No. 103 ranging to 3.500, to third decimal place

Supplied to U. S. and Canadian Governments, industrial chemists, colleges, etc.



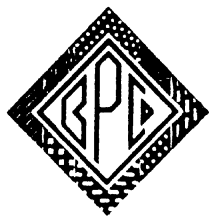
## TORSION LABORATORY BALANCE NO. 255

The accepted standard for laboratory work.

Capacity	4 1/2 kg	(10 lb.)
Sensitiveness	1/15 gram	(1 grain)
Pans	8" diameter	

Equipped with or without graduated slide beam, metric or avoirdupois.





## BECKLEY PERFORATING COMPANY

202 North Avenue

GARWOOD, N. J.

### PRODUCTS

Perforated Metal of all kinds, for all purposes, for Chemical Plants, Centrifugal Linings, Phosphate Mines, Fertilizer Plants, Sand, Gravel, Coal and Coke Screens, Ore and Shaker Screens, Strainers, Stamp Batteries, Oil and Gas Stoves, Cotton Seed Oil Mills, etc.

Steel Tanks, Electrically Welded; Tanks with Lead and other linings; Tanks of any metal; Open Type, Pressure, Storage, Chemical, Air, Mixing, Dissolving, Jacketed and Special Tanks for Special Purposes.

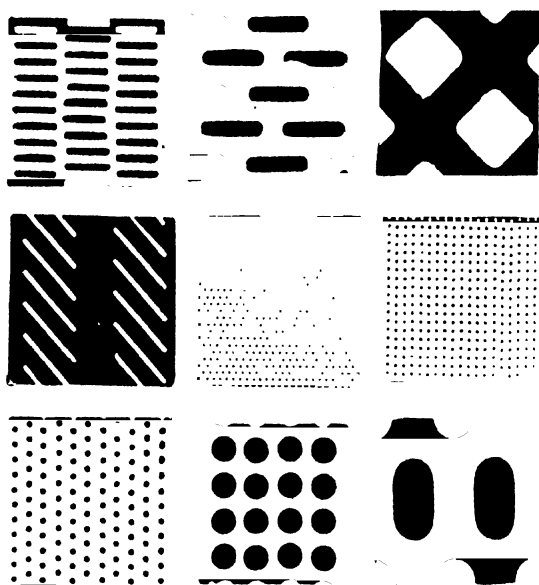
Stacks; Elbows; Chutes; Pans; Cylinders, etc.

Special Sheet Metal Work.

### PERFORATED METAL

Our Perforated Metal is suitable for all industrial chemical and metallurgical purposes. We are equipped to perforate metal with perforations as small as .020 and we have varieties suitable for use in chemical plants, ore and shaker screens, strainers, filters, stamp batteries, mining and smelting works, silver reduction, sugar refineries, etc.

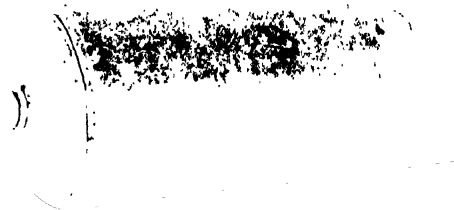
We shall be pleased to quote on your requirements for perforated metal and feel sure that from the many perforations we have to offer you can find something that will solve your screening or separating needs.



A FEW OF THE MANY TYPES OF PERFORATED METAL WE SUPPLY

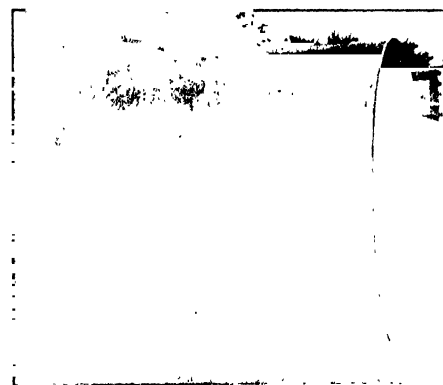
### TANKS

We manufacture all types of square and rectangular tanks. Round tanks up to 10' diameter, 40' in length. They are electrically welded and constructed in accordance with recognized up-to-date standards.



ELECTRICALLY WELDED PRESSURE TANK

The majority of our tanks have been furnished to the chemical industries and are giving satisfactory service. Many furnished where oil or gas tight conditions are absolutely imperative.



TANK FOR OIL STORAGE

### PANS

We manufacture many types. Crystallizing, dyeing, lathe drip and shop pans.

### PRICES

Our prices will be found as low as is consistent with first class workmanship, which we make our first consideration in all cases.

Send us your specifications or blueprints and we shall be pleased to quote on your requirements. We can refer you to many satisfied users of equipment furnished to the chemical industries.

# BELMONT PACKING AND RUBBER CO.

PHILADELPHIA, PA.

BRANCHES

New York Chicago  
AGENCIES IN ALL PRINCIPAL CITIES

## PRODUCTS

Packings for every purpose; Flax, Hemp, Rubber, Asbestos, Cotton, Paper Fiber, and Metallic.

Gaskets; Asbestos, Rubber, Copper, Compressed Sheet and Paper Fiber.

Rubber Hose for every purpose.

Rubber Belting for Transmission, Elevating and Conveying.

Rubber Pump Valves.

Regular and Special items in rubber.

Acid Resisting Rubber Boots.



Asbestos is received from the Canadian Mines and is crushed, carded, spun and woven, braided or twisted into its final form.

## CONSULTATION

Our General Catalog is one of the most complete issued covering packings for a wide variety of services—one will be cheerfully furnished upon request. However, our catalog does not cover our entire manufacturing efforts as we are often called upon to evolve special constructions to meet unusual conditions. The work of recommending is done by packing specialists in our own organization who with years of practical experience view the situation from the engineer's standpoint. The service of recommending and of submitting samples is gratis and involves no obligation to follow the suggestions. Consult us.

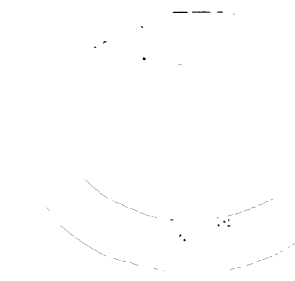
## ORGANIZATION

It would not be possible in this limited space to clearly outline the comprehensiveness of our manufacturing efforts nor the completeness of our organization. For this reason we suggest the requesting of our General Catalog in which packings for all conditions are illustrated and described.

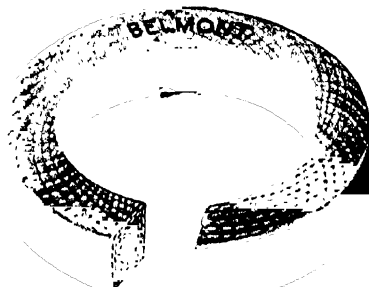


FACTORY, FRANKFORD JUNCTION, PHILADELPHIA

Flax and Hemp are received in their raw state direct from the primary markets. Hackling, carding, spinning, braiding and lubricating are done entirely in our own plant with the most modern equipment.



BELMONT ASBESTOS GASKETS STYLE 806



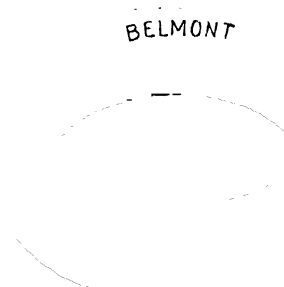
BELMONT STYLE 19 HOLLOW CENTER PACKING

The hollow center offers a point of least resistance and compensates for all changes of expansion and contraction due to changes of pressures and resulting temperatures. Booklet 19 explains this packing fully.



BELMONT STYLE 1 EXPANSION PACKING

For steam, ammonia and hot water. Write for booklet "A."



BELMONT STYLE 751 BRAIDED ASBESTOS STEAM PACKING

For superheated and high pressure steam, air compressor rods, high speed engines, expansion joints, locomotive air pumps and throttles. Write for booklet "B."

# BENJAMIN ELECTRIC MFG. CO.

SALES AND DISTRIBUTING OFFICES  
CHICAGO

NEW YORK

Benjamin Electric Mfg. Co. of Canada, Ltd.  
Montreal—Toronto—Winnipeg

**BENJAMIN**  
Makers of Things More Useful

FACTORIES Chicago and Des Moines, Ill.

SAN FRANCISCO

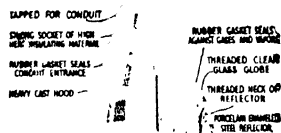
The Benjamin Electric, Ltd.,  
London, England

## PRODUCTS

Benjamin Industrial Lighting  
Acid Proof Lighting Fixtures  
Gas and Vapor Proof Lighting Fixtures  
Weatherproof Lighting Apparatus  
Marine Lighting and Signaling Apparatus  
Store and Office Lighting Fixtures  
Porcelain Enameled Reflectors and Specialties  
Industrial Signals  
Panel Boards and Cabinets  
Wiring Devices  
Electrical Specialties  
Two-way Plugs  
Automobile Specialties  
Punch Press Safety Devices  
Drawings, Stampings, and Spinings in Sheet Metal  
Consulting and Engineering Service

## BENJAMIN GAS AND VAPOR PROOF FIXTURES

Chemical works, powder mills, and varnish and paint factories represent a group which has its own lighting problem. Corrosion and damage from acids, fumes and gases must be considered. Danger to employees from explosion and ignition through contact of gases, dust and vapors with the hot lamps or other portions of the lighting unit demands the installation of gas and vapor proof equipment.



SECTION SHOWING CONSTRUCTION OF HOOD ON HEAVY DUTY GAS AND VAPOR PROOF FIXTURES



HEAVY DUTY GAS AND VAPOR PROOF FIXTURE WITH DOME REFLECTOR

Benjamin Heavy Duty Gas and Vapor Proof Fixtures are units of unusual rugged construction for use in all industries or places where inflammable matter is handled, or dust and dangerous gases and vapors are present in the atmosphere. They will stand up under the most rigorous conditions and are an insurance against loss by fire or explosion wherever hazardous atmospheric conditions prevail. A special cast hood supports socket reflector and heavy screw globe which tightly encloses the lamp. Furnished with Dome, Bowl or Symmetrical Angle reflector, in four sizes for lamps from 75 to 500 watts.

## GAS AND VAPOR PROOF HAND PORTABLE



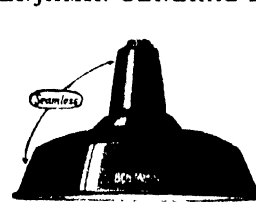
GAS AND VAPOR PROOF HAND PORTABLE

This portable light is convenient for use in the presence of gases and vapors. Consists of wooden handle with stuffing gland and porcelain receptacle, and 6 inch, 25 to 60 watt tubular lamp tightly enclosed in heavy screw globe, protected by removable metal guard with hinged hook.

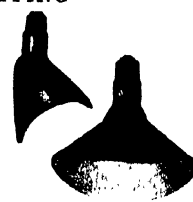
## ENGINEERING SERVICE

The Benjamin Company maintains an Illuminating Engineering service for the purpose of giving practical advice regarding lighting problems.

## BENJAMIN GENERAL LIGHTING



SEAMLESS DOME REFLECTOR SOCKET



ELLIPTICAL ANGLE REFLECTOR

The Benjamin Company specializes in reflectors and fixtures for industrial lighting. Each unit has been designed and perfected to meet specific requirements of lighting in industrial plants. Benjamin Lighting saves its cost in a few months—then pays big dividends.

## BENJAMIN MOISTURE AND DUST PROOF FIXTURES

These fixtures are for use in refrigerating plants, engine rooms, plating rooms, etc., and other places where it is desirable to protect the lamp and live electrical parts from deposits of moisture, dust and dirt. A copper or aluminum hood supports socket and heavy clear screw globe. Furnished in three sizes for lamps from 25 to 100 watts.



MOISTURE AND DUST PROOF FIXTURE

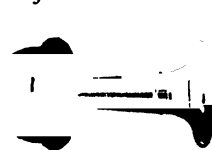
## BENJAMIN ACID RESISTING FIXTURE



ACID RESISTING FIXTURE

This fixture is for use in acid plants, electroplating shops, pickling rooms, powder plants, oil refineries, paint shops and places where lighting equipment must be protected from corrosive acids, explosive fumes, or moisture. A special lead alloy or aluminum cement coated hood supports socket and clear Holograph prismatic globe. Furnished in two sizes for lamps from 75 to 150 watts. Fumes from acids and corrosive gases cannot destroy the illuminating efficiency of this unit.

## BENJAMIN INDUSTRIAL SIGNALS



WEATHERPROOF INDUSTRIAL SIGNAL HORN

For Calls, Warnings and Fire Alarms the Benjamin Industrial Signals are more effective than bells and gongs. Their powerful, far-reaching tone with a distinctive tone pitch can be heard above the din of machinery and other noises.

## INQUIRIES

Inquiries relative to any class of Benjamin Products are invited. Catalogs covering our lines are available for distribution.

## A. BERRY COPPER WORKS

Copper Equipment for All Industries

249 WEST BROADWAY, NEW YORK, N. Y.

### PRODUCTS

#### Chemical Apparatus of Copper

Tanks	Steam Jacketed Kettles
Still	Mixing Kettles
Heating Coils	Solvent Recovery Apparatus
Cooling Coils	Tin and Lead Lined Apparatus
Vacuum Pans	

We make a specialty of repairs to copper work

### EXPERIENCE

We have been building special industrial equipment of copper for many years. We have experienced coppersmiths with every facility at hand for giving our clients the highest results in workmanship at a minimum cost.

### SPECIAL EQUIPMENT

When a company is designing copper equipment with an entirely new idea involved, they should submit the design to a competent coppersmithing firm, who will advise them whether the equipment will be mechanically strong, economical to operate, etc. We have done a great deal of this class of work, and have met many difficult specifications.

### DISTILLING APPARATUS

Illustration shows a refining still of copper. We build all types of distilling apparatus, continuous or periodic, to operate either under a vacuum or at atmospheric pressure, to handle almost any volatile liquid, and constructed of the proper material for the liquid being handled. The design of our apparatus conforms with the most modern and accepted engineering practise.

The copper jacketed still, shown on this page, is tested to 100 pounds steam pressure and can be built in sizes up to 300 gallons capacity.

### COPPER DYE PANS

The above pans are made in all sizes

### SERVICE

We will be pleased to estimate on any plans or specifications that may be sent us by chemical engineers or others in charge of the design, or the operation, of plants employing chemical processes and using copper apparatus.

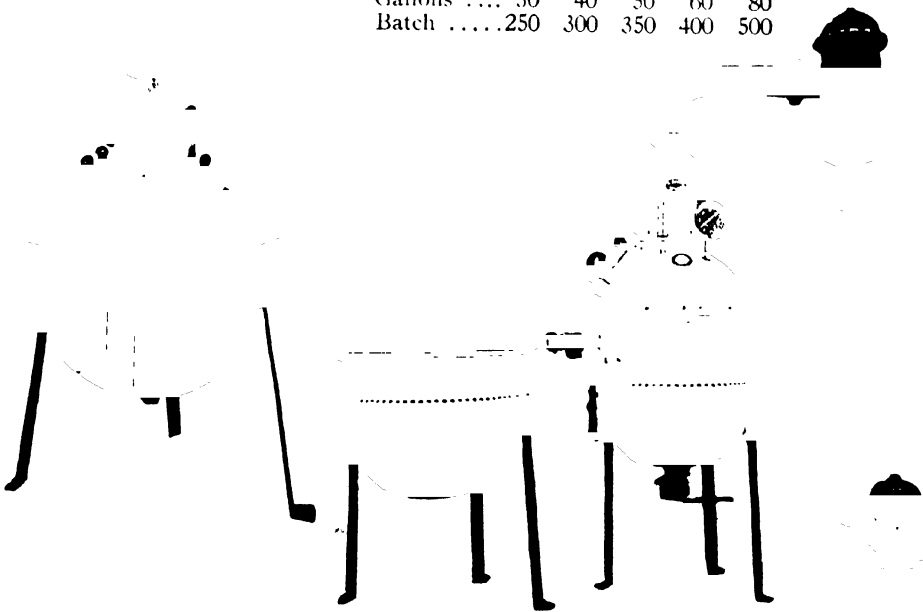
Our experience makes us confident that we can render satisfactory service in building any type of copper apparatus.

We will guarantee to carry out designs in a faithful and intelligent manner, but when requested we will be pleased to assist with our practical knowledge of coppersmithing to supplement our clients' ability as engineers.

### LATEST IMPROVED VACUUM PAN

Complete with Steam Jacketed Boiling Kettle, Condenser and Vacuum Pump. Our Pan and Boiling Kettle are made out of heavy copper and tested to 200 lbs. water pressure. This pan is mostly used for cooking Hard Candy, Cream, Syrup, etc.

Gallons ....	30	40	50	60	80
Batch .....	250	300	350	400	500



COPPER STEAM JACKETED STILL

LATEST IMPROVED VACUUM PAN



Trade-Mark

## EDWARD H. BEST & CO., INC.

"Knoxall Textiles"

222-224 Purchase Street

BOSTON, MASS.

### PRODUCTS

Clearer Cloth  
 Roller Cloth  
 Slasher Cloth  
 Finishing Fabrics  
 Fume Bags, Cotton and Wool  
 Polishing Felts  
 Filter Cloths, Pure Wool  
 Filter Cloths, Cotton, Camel's Hair, Linen and Silk  
 Cotton Sheetings and Ducks  
 Mechanical Felts, Cotton and Wool  
 Endless Woolen Blankets and Jackets

### SPECIALISTS ON MECHANICAL FABRICS

The efficient application of mechanical fabrics plays an important part, when used in manufacturing processes. We all realize that we can spend unnecessary sums of money in using fabrics not at all suited for our work. Considering this, it has been our aim to solve the various problems that confront manufacturers, with the purpose of producing special constructions, that meet, to the best advantage, the specific needs.

If you have any problems that require fabrics, no matter what construction, whether Cotton or Wool, please allow us to cooperate with you. We offer the advantage of our thirty-five years' experience.

In the manufacture of our Woolen goods, great care is used in the selection of proper yarns. These constructions are made of pure, live Wool, free from all adulteration; we do not use shoddy, or fillers of any kind. We are positive that the satisfactory results, and greater length of service obtained with the use of such fabrics will prove to your advantage.

### ROLLER, CLEARER AND SLASHER CLOTHS

Our Roller, Clearer and Slasher Cloths are considered the standard among Cotton and Woolen manufacturers. They are made of pure, live wool, free from adulteration.

### FINISHING FABRICS

We carry an extensive line of Leaders and Aprons, both Cotton and Wool, for various Finishing processes.

### WOOLEN BLANKETS

We can furnish Blankets or Jackets of various thicknesses, and practically any size, length or width. These are made seamless.

### FUME BAGS

Our Woolen Bags are made of specially selected yarn, in a construction best suited for the purpose. We can furnish any size; also carry Cotton Bags, of various sizes, made up to standard specifications.

### FILTER CLOTHS

We aim to carry a complete line of constructions, both Cotton and Wool, in various sizes, as well as Camel's Hair. For many years we have been helping solve the unusual problem. This is our special interest, and, if you have any such problem, should like to offer you our cooperation. Our Knoxall Wool Filter fabrics are made of pure live Wool.

### STANDARD OPERATIONS

For standard operations we maintain a stock of materials that will assure prompt delivery.

### SPECIAL CONSTRUCTIONS

If you require a special construction of fabric, either Cotton or Wool, let us help you.

# BETHLEHEM FOUNDRY & MACHINE CORPORATION

Engineers and Contractors

Singer Building, 149 Broadway  
NEW YORK, N. Y.

131 Front Street  
BETHLEHEM, PA.

## PRODUCTS

Chemical Equipment of Metal, including:

Autoclaves	Stills
Cooling Tubes	Nitric and other Retorts
Condensers	Sight Glasses
Kettles	Plain and Separating
Mixers	Sulphonators
Nitrators	Vacuum Stills
Reducers	Washers
Reducer Blades	Heaters and Coolers
Special Equipment of all kinds.	

We are prepared to furnish Lead Lined Equipment.

## GUARANTEE

We cannot guarantee users of our equipment against personal or plant injuries or loss of material when operating, but we do guarantee no chaplets, filling or "doctoring" of parts in contact with chemicals; all material and workmanship to be of highest grade applicable to this class of equipment.

Capacities are calculated to main cover flanges.

Cut gears are invariably used unless others stated.

## NITRATORS

With either corrugated or plain cylindrical walls. Fitted with one propeller of true marine type and draft tube (non-swirl). (Patented.) Propeller locked to end of shaft

to prevent coming off. Vertical thrust supported by ball bearing with dust proof cap.

Cast iron body in steel jacket so designed that a

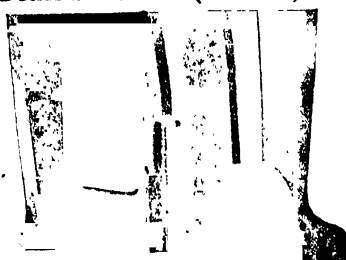
## SULPHONATORS

Sulphonators of plate steel or cast iron equipped with draft tube (non-swirl), or any other type of agitator to suit conditions.

SULPHONATOR

SULPHONATOR

## DRAFT TUBES (Patented)



DRAFT TUBE (Patented)

Inverted where precipitates are present

### SIZES

Non swirl Draft Tubes are made for the following diameters of right hand propellers, running clockwise

12 in.  
15 in.  
18 in.  
21 in.  
24 in.  
30 in.  
36 in.

Larger sizes can be supplied to order.

TABLE OF DIMENSIONS

Capacity in gallons to main cover flange	50	100	300	600	800	(Corrugated) 1000	(Corrugated) 1600
Inside diameter of vessel	24"	26"	36"	48"	48"	47 1/2" (Average)	5'11" (Average)
Inside depth of vessel	3'11"	3'0"	5'0"	6'0"	7'0"	8'6"	8'0"
Height over all	5'11"	5'11"	8'1 1/2"	9'5 1/2"	10'6 1/2"	11'8"	13'8"
Floor space	3'4"x2'8"	3'4"x3'4"	4'11"x5'3 1/2"	6'2 1/2"x5'7"	6'7"x6'1"	7'0"x6'6 1/2"	7'10 1/4"x7'10 1/4"
Pulleys, tight and loose	12"x24"	12"x24"	15"x31"	20"x41"	20"x41"	20"x41"	20"x41"

Usual Propeller Speed

Usual Pulley Speed

250 R P M

300 R P M

Nitrators of 100 gallons capacity or larger either with or without internal cooling tubes, as may be desired

forced circulation through the internal tubes and jacket may be obtained. Everything complete.

TABLE OF DIMENSIONS

Capacity to main cover flange in gallons	50	100	300	600	800	1800	2300
Inside dia of vessel	24"	26"	36"	48"	48"	6'0"	6'0"
Depth (inside)	3'0"	3'0"	5'7"	7'0"	7'6"	9'0"	11'0"
Height over all	4'5"	6'8 1/2"	10'9 1/2"	11'5"	12'7"	14'0"	15'1"
Floor space	3'3"x3'9"	3'0"x3'10 1/2"	4'9"x5'4"	5'4"x5'4"	6'1"x6'1"	7'6"x7'8 1/2"	7'6"x7'8"
Pulleys	12"x24"	12"x24"	15"x31"	16"x41"	16"x41"	24"x44"	24"x44"

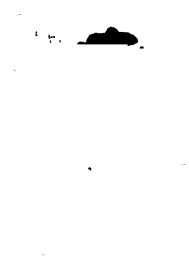
Usual propeller speed, 250 R.P.M.

Usual pulley speed, 300 R.P.M.

For use in vessels in which it is desired to mix thoroughly liquids of different specific gravities. The vanes counteract the swirling motion caused by the propeller, that occurs where using many other or no tubes. By the non-swirl method the center or core of liquid is continually brought to the wall of the main container and a more thorough mixing and heat exchanging condition is obtained. Settling tanks equipped with the non-swirl tube are superior to others—there being no swirl, the material may begin settling immediately.

Continued on Next Page

## REDUCERS, PLAIN OR JACKETED

STEAM JACKETED  
REDUCER

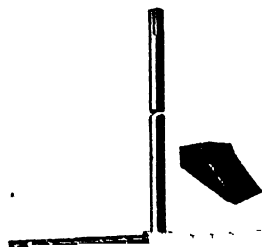
Cast iron shell and cover. Cast iron lining plates easily replaced. Solid vertical cast iron or steel shaft, as desired, suspended from bearing in heavy yoke at top of reducer. Removable without disturbing pulley shaft. Either single blade or plow scrapers, as desired. Specially designed bottom step bearing. Steam admitted through door.

Also made with simple lifting device for main shaft

TABLE OF DIMENSIONS

Capacity to main cover flange in gallons	200	500	1600
Diameter (inside)	3' 0"	4' 0"	6' 2"
Depth (inside)	4' 3"	5' 3"	8' 0"
Height over all	6' 7"	7' 6 1/4"	10' 4 1/4"
Floor space	4' 6 1/2" x 3' 6"	6' 10" x 4' 8"	8' 7" x 6' 9"
Pulleys	20" x 4 1/4"	24" x 4 1/4"	30" x 4"
Gear ratio	2 : 1	3 : 1	50 : 18
Pulley speed	80	120	110

## REDUCER BLADES (Patented)



REDUCER BLADE (Patented)

Experience has shown that the ordinary form of reducer blade is inefficient and unsatisfactory, because of the difficulty of making repairs and the necessity of discarding an entire agitator should one blade become worn.

We have designed and patented a special form of blade, permitting any plow to be removed through the hand hole when worn out, avoiding the necessity of anyone entering the machine and thus eliminating the risk of aniline poisoning. Similarly a whole arm may be replaced without difficulty.

We not only supply these blades with our own reducers, unless otherwise requested, but also are ready to remodel reducers of other makes introducing this improvement.

Some of the largest users of reducers have adopted the new form of blade throughout their entire installation.

Insert shows one section of removable blade.

## REDUCER VALVES

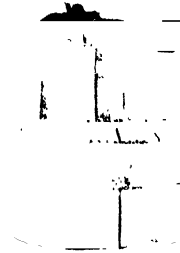
This valve was designed to obviate the necessity of cleaning the valve seat after every charge.



REDUCER VALVES

Up to date of printing they have been in actual use for over a hundred charges, without changing, repairs or leakage. The stem has a short thread for quick opening.

## VACUUM STILLS

75 GALLON CAST IRON  
STILL6' OIL JACKETED  
VACUUM STILL

5' STEAM JACKETED STILL



8' STEAM JACKETED STILL

Body cast iron and jacket of cast iron or steel. Heavy vertical shaft suspended at top by double thrust ball bearing and guided at bottom by step bearing, is driven by very heavily constructed back geared worm and wheel.

Substantial bottom and side scrapers mounted on vertical shaft.

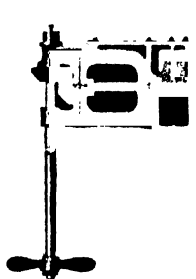
Stills are designed throughout for heavy duty and are extensively used for acetic acid and aniline distillation and similar operations.

**Seventy-five Gallon Cast-Iron Still**—For semi-commercial use in developing new processes and other cases where small equipment of actual commercial type is required.

TABLE OF DIMENSIONS, ETC., OF OIL AND STEAM JACKETED  
VACUUM STILL

Capacity in gals. to main flange	75	500	800	1400-1600
Inside diam of vessel	25"	60"	72"	96"
Inside depth of vessel	24"	42"	48"	48"
Height over all excluding columns or setting	62"	93 1/4"	118"	112 1/4"-122 1/4"
Floor space	38" x 42"	77" x 85"	94" x 94"	115" x 115"
Pulleys — tight and loose	24" x 4"	24" x 6"	24" x 8"	(one) 22" x 10 1/2"
Pulley speed (usual)	120-160	190	160	160
R. P. M.	120-160	190	160	160

Continued on Next Page



STANDARD DRIVE

**STANDARD DRIVE**

A high-grade, self-contained drive for any piece of chemical apparatus. Cast iron frame. Fully enclosed ball thrust bearing at upper end of vertical shaft. Vertical shaft bearings—bronze bushed. Horizontal shaft bearings—babbitted. Gear ratio 4 to 5 (may be altered slightly). Cut gears. Propellers of true marine type locked to shaft by cross-key to prevent coming off. Tight and loose pulleys. No oil cups furnished. Belt shifter and gear guards.

Note.—Lower bearing may be left off in case customer desires to place this in cover of apparatus.

**AUTOCLAVES**

AUTOCLAVE

In the design and building of our autoclaves we have realized fully the high pressures required for operating safety and efficiency.

We build these machines with an ample factor of safety in order to meet the most exacting requirements. They are built with or without steel-jackets, and are cast from plain or semi-steel or from a special steel to formula. We also will build these machines to specification.

**EMULSIFIER**

We have developed an emulsifier which has proved itself over a period of several months of continuous operation under severe actual service conditions.

Temporary emulsions are quickly and completely emulsified, the machine giving general operating satisfaction to users.

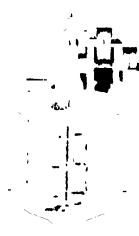


EMULSIFIER

This machine has been applied by some manufacturers to the mixing of materials that are of such a nature as to require an unusually sturdy mixer, together with an efficient type of agitator. It is steam-jacketed. Capacity, 100, 200 and 400 gallons. Other sizes can be built on order.

**BETHLEHEM DOUBLE ACTION VESSEL**

This apparatus is efficient for the mixing of a light liquid with a heavier previous charge.



DOUBLE ACTION VESSEL

It contains a slow speed horse-shoe scraper-type agitator running close to the wall of the vessel, and a high speed propeller agitator rotating in the opposite direction. They may be driven simultaneously or singly, as desired.

The action of the propellers causes the lighter liquid to gather near the center, from which it is combed into the mass by the parallel rods.

This vessel is designed for a capacity of 200 gallons.

**WASHERS**

Specially designed washers, constructed of steel plate—lead lined if desired—agitators to suit, with or without Non-Swirl Draft Tube. May be equipped with steam coils if desired.



WASHER

**JACKETED STILLS**

Specially designed stills, either jacketed or plain and arranged for various forms of heating, including steam coils, are furnished by us. Size and number of outlets to suit customers' requirements.

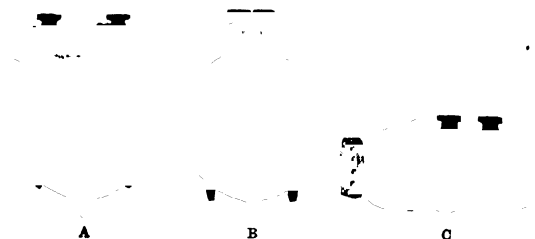


JACKETED STILL

**CONDENSERS**

The tanks of these condensers are of steel plate (or any other metal to suit) and the coils of iron pipe, seamless steel tube, copper, aluminum, silver, lead, etc.

These condensers can be built in any size required.



THREE TYPES OF ACID EGGS

**SIZES AND CAPACITIES**

	TYPE "A" Vertical Egg				TYPE "B" Vertical Egg		TYPE "C" Horizontal Egg				
Capacity Cu. ft.	17	24	54	66	35	80	26	47	75	83	123
Gals.	127	180	405	495	262	600	195	337	562	622	922
Approx. wt. (lbs.)	3900	4700	7400	8600	6000	10750	4600	6500	11500	9000	12400

**NITRIC ACID RETORTS**

These retorts are based on many years' close co-operation with the user. The mixture has been carefully developed and the resultant life is prolonged thereby.

Each retort is a duplicate of a previous one, as we use one formula for them and each heat is sampled and analyzed. Each retort is successful and you will find a duplicate of it in our foundry.

NITRIC ACID RETORT



# BETHLEHEM FOUNDRY AND MACHINE CO.

131 FRONT ST., BETHLEHEM, PA.

NEW YORK OFFICE SINGER BUILDING, 149 Broadway

## PRODUCTS

### "Bethlehem Built" Apparatus:

Acid Eggs	Salt Pans
Acid Tanks	Special Valves
Autoclaves	Special Fittings
Acid Stills	Nitrators
Chemical Pots	Sulfonators
Chemical Castings	Reducers
D. Retorts	

Iron and Steel Apparatus for the manufacture of Sulphuric, Nitric, Muriatic, Stearic and Other Acids.

A wide variety of General Apparatus.

## TECHNICAL CONTROL IN OUR PLANT

We actually have, in every detail, Chemical Control in our foundry. This control extends from sampling and analyzing our raw materials, that include pig-iron, coke, machinery scrap, etc., to the testing and analyzing of our castings.

Our metallurgical chemists control every heat in the foundry and supervise the charging of the cupola.

This thorough control by our experts accounts for the high quality and reputation of our products.

## DEPRECIATION

The depreciation that goes on in all industrial equipment reaches a point at some time where renewal is necessary for efficient operation of a process. Many industrial plant operators having found a piece of chemical equipment very successful in operation often hesitate to place an order for a duplicate unit, as they fear the new one will not be as satisfactory as the first. They make many repairs far beyond the recognized period of efficient operation and maintenance of equipment.

Wherever done this results in poor plant economy in the long run.

Because of our absolute foundry control of each piece of equipment and every casting turned out by us, our customers know we can always duplicate our efficient equipment.

We have helped many of the largest concerns in the country to solve their most difficult problems. This experience is at your service.

## "CORROSIRON"

For equipment requiring an acid resisting iron we use "Corrosiron."

This highly successful product is supplied by us in the East under a special arrangement with the Pacific Foundry Company, San Francisco, Calif., the originators and proprietors of "Corrosiron."

This co-operative arrangement includes the production and sale of "Corrosiron" castings from our South Bethlehem plant.

Corrosiron needs little introduction to men interested in a machinable chemical resistant metal. It is a very superior acid and alkali resisting metal.

Especially in connection with sulphuric and nitric acid process has CORROSIRON proven its acid resistance.

Supplied in the shape of pumps of various kinds, plug cocks, globe valves, pipes and castings of every variety. We will gladly send you a sample to undergo any test you may wish to make.

## ADVANTAGES OF CORROSIRON

Wherever "Corrosiron" has been employed in the making of chemical apparatus, it has been found to meet the demand for an anti-corrosive iron.

It has endurance beyond that possessed by other mixtures.

It is dependable at all times, where the unusual is required of the metal.

"Corrosiron" used in making of chemical castings by the Bethlehem Foundry and Machine Co. is a guarantee above that commonly offered to purchasers.

## BETHLEHEM POLICY

Our policy is to make our foundry and our shops, our engineers and specialists a part of our customers' organization in so far as solving their troubles and developing their ideas are concerned. This policy we feel is necessary to the attainment of successful operations in the chemical industries of the United States; so much a part of the further development of chemical products in peace time competition with those of other nations.

## CUSTOMERS' DESIGNS PROTECTED

Our product is built entirely from customers' specifications, under careful supervision, including chemical control of all mixtures.

Every customer is scrupulously protected as to his exclusive ideas or designs.

## THE BIEHL IRON WORKS

Incorporated

Designers and Builders of Industrial Cars  
READING, PA., U. S. A.

### PRODUCTS

Industrial Cars, Rails, Portable Track, Switches, Crossings, Turntables, Wheels and Axles, Car Unloaders, Charging Barrows, Coal and Ore Tubs.

### BIEHL EQUIPMENT

Our products are the best of their kind to be had. Use our equipment and be convinced.

Biehl cars are built to suit any industrial requirement.

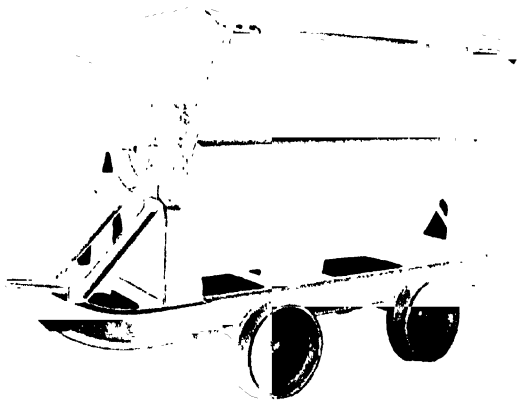
Buckets are built in all standard sizes and capacities.

Full specifications and blueprints of our equipment for any purpose upon request.

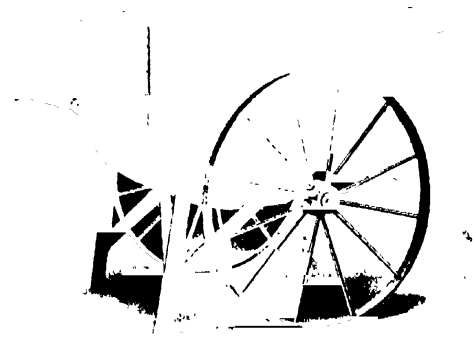
Our experience of over sixty years gives customers entire benefit in proper design and construction.



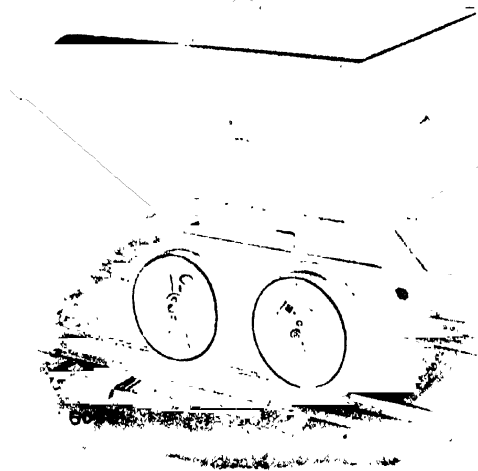
STANDARD CAR UNLOADER



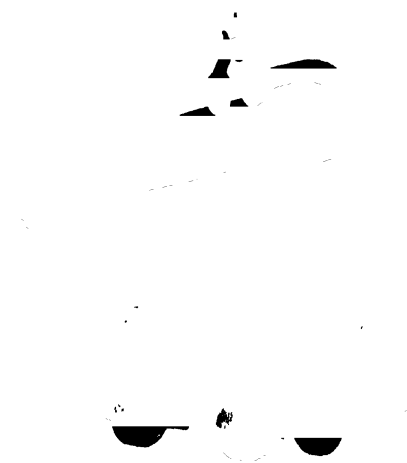
STANDARD SIDE DUMP CAR



BIEHL FIGURE 38 CHARGING BARROW



STANDARD SCOOP CAR



COAL AND ORE TUB

# THE BIGGS BOILER WORKS COMPANY

Manufacturers of

Steel Storage and Pressure Tanks of Every Description  
Paper Mill Machinery, Rubber Machinery

WILLIAMS AND BANK STREETS, AKRON, OHIO

## PRODUCTS

Steel Tanks of every description including Mixing Tanks, Steam Jacketed Tanks, Pneumatic Water Supply Tanks, Air Receivers, Hot Water Storage Tanks, Oil and Gasoline Storage Tanks, Condensers, Coolers, Evaporators, Steel Riveted Pipe, Smoke Stacks, Steel Plate Construction of every description, Vulcanizers, Devulcanizers, Globe and Cylinder Rotary Bleaching Boilers.

## STORAGE AND PRESSURE TANKS

We are prepared to ship from stock Steel Storage and Pressure Tanks ranging in capacity from 84 to 25,000 gallons. Our line of Standard Pressure Tanks that we carry in stock are designed for working pressures from 75 to 110 lbs. and include such tanks as Pneumatic Water Supply Tanks, Hot Water Storage Tanks and Air Receivers. If interested in tanks of this description, write for Price List "F."

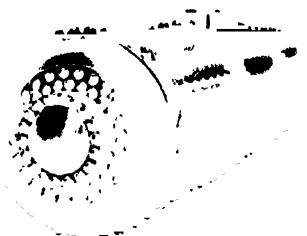


STORAGE AND PRESSURE TANK

Our line of Storage Tanks consists of what is commonly termed Extra Heavy Gasoline and Oil Storage Tanks, and are covered by our Price Lists No. 25 and No. 30. These Lists are very complete, giving the weight, capacity, thickness of material, etc., on 166 tanks. Capacities range from 85 to 25,000 gallons. Our Gasoline Storage Tanks, when desired, are furnished with Underwriters' Label, the construction meeting the Underwriters' requirements.

## HIGH PRESSURE TANKS

The accompanying illustration shows an extremely high duty tank for working pressures of 500 to 600



HIGH PRESSURE TANK

lbs. The shell plates of the tanks are  $1\frac{1}{4}$ " in thickness, rivets  $1\frac{5}{16}$ " diameter. Inasmuch as our plant is hydraulically equipped thruout, we are in position to fabricate plates up to  $1\frac{1}{2}$ " in thickness, and specialize in steel plate construction of every description, such as Riveted Steel Pipe, Penn Stocks, etc.

## ROTARY BLEACHING BOILERS

Our Globe and Cylinder Rotary Bleaching Boilers are recognized as standard equipment by the majority of the leading paper mills in the United States and Canada.

The Cylinder Rotary Bleaching Boilers are furnished in various

sizes, and are used principally in the cooking of rags, rope, paper, etc.

The Globe Rotary Bleaching Boilers are used extensively by the strawboard mills for the cooking of straw, grass and



ROTARY BLEACHING BOILER

various similar materials for the making of strawboard. The 14' diameter is the size most commonly specified, although we are prepared to furnish our Globes in practically all sizes. The accompanying illustration shows a small 3' diameter Globe with welded joints for experimental purposes.

## VULCANIZERS FOR RUBBER WORKS

Our last specialty--and by no means the least important--is Vulcanizers for the rubber trade. We have furnished the rubber trade with vulcanizers since 1887, and Biggs Vulcanizers have been adopted as standard equipment by practically all leading rubber companies. Our Simplex Patented Quick Opening Door which opens and closes without the use of mechanical means of any description, the operation being completed in less than eight seconds, is recognized by engineering experts and leading insurance companies as the safest and most efficient door on the market. This door can be furnished in all sizes



RUBBER VULCANIZER

and for all pressures, and is used not alone on vulcanizers, but on Retorts of any description where it is desirable to have the entire end open for loading and unloading, such as Creosoting Cylinders, Hardening Cylinders, Sterilizers, etc.

## PRICE LISTS

Price Lists and Catalogs on our complete lines will be gladly furnished on request.

# J. BISHOP & CO. PLATINUM WORKS

Manufacturers and Refiners of Platinum, Gold and Silver

THE FIRST PLATINUM WORKS IN THE UNITED STATES

1842--Seventy-Nine Years' Experience in Platinum Working--1921

MALVERN, PA.

## PRODUCTS

Platinum ware in any form for Chemical, Electro-chemical and Metallurgical uses, including:

Crucibles, plain and special form	
Dishes	Pans
Retorts	Bottles
Cones	Filters
Combustion tubes and boats	
Tongs	Tweezers
Muffles	Spatulas
Anodes, solid or spiral	Cathodes, solid or mesh
Electrodes in all forms and sizes	
Triangles	Spoons
Cautery points	Gauze
Wire	Sheet
Foil	Rivets and Contacts

Platinum sponge

Surgical, Physical and Chemical Apparatus

Other metals of the Platinum group, pure or alloyed

Assaying of metals of the Platinum group

Platinum Scrap bought or taken in exchange

Palladium

Iridium

Platinum-Rhodium Thermo Couples

Salts and Solution of the Platinum Metals

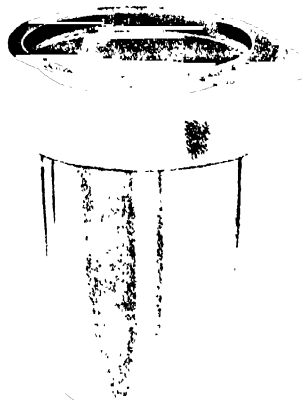


## GENERAL

Bishop standard platinum laboratory ware is made from platinum that is specially refined for the purpose. Before shipping it is subjected to a rigid test and is guaranteed against chemical or physical defects. Special forms for special purposes for the analyst, metallurgist, and manufacturing processes.



HAMMERED PLATINUM DISH  
Fig. 20

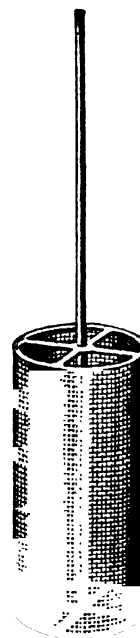


HAMMERED PLATINUM CRUCIBLE  
Fig. 25

Crucibles weigh as many grams as their cc. capacity.

Dishes weigh approximately one-third as many grams as their cc. capacity.

CATALOG ON REQUEST



PLATINUM CATHODE  
Fig. 60

# BLEACH PROCESS COMPANY

Designers of Complete Electrolytic Plants

APPLETON, WISCONSIN

FOREIGN REPRESENTATIVES

Montreal, Que., Process Engineers, Ltd., McGill Building

London, Eng., Ernest Scott & Co., Kingway

## PRODUCTS

The Wheeler Process with The Wheeler Circular Cell for the manufacture of Chlorine Gas, Liquid Chlorine, Bleach, Caustic Soda and Caustic Potash.

## OUR SERVICES

**Engineers**—We furnish blueprints, directions, specifications and instructions to enable an engineer to erect, install and operate a complete plant or any part thereof.

**Operators**—We will supply competent men, familiar with all phases of the process, to start or operate a new installation, or any part thereof.

**Instructors**—We will teach men sent by the purchaser, in a running plant, that they may become familiar with all details of construction or operation.

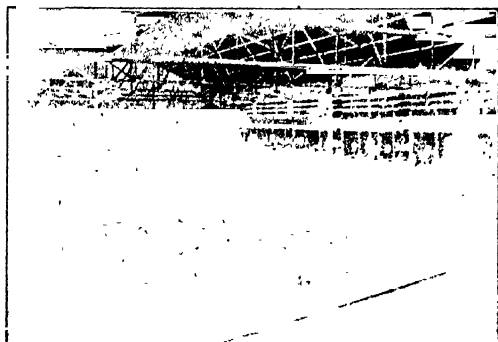
**Purchasers**—We will purchase any part of a plant for a client, or work in conjunction with another purchasing agent as may be preferred.

**Consultants**—We will act as consulting engineers in connection with an installation to the end that the purchaser will obtain the results predicted.

## THE WHEELER PROCESS

Practical experience has demonstrated the fact that the auxiliary equipment and the operation of the plant are as important as the cell. The use of evaporated or marine salt, the concentration of the cell effluent, the recovery of the salt, the finishing of the caustic soda or potash, the manufacture of dry bleach or the adaptation of the plant to other processes, each presents special problems.

Nineteen years of experimenting and practical experience in the development of The Wheeler Process permits us to predict with certainty what can be accomplished under all conditions in any locality.



**WHEELER CIRCULAR CELLS**

An installation in a cell room 52 ft. by 90 ft. including aisles.  
Producing 3650 tons of caustic soda annually

## THE WHEELER CIRCULAR CELL

Advantages:

Low cost of installation	Low maintenance cost
Ease of operation	Accessibility
Saving of floor space	Maximum efficiency

Our cell form permits a design which delivers the highest efficiencies with long diaphragm life and minimum stub loss.

There are more circular cells in operation than all other types combined.

## DATA

Our plant records show the following:

Cells of the same form operating at either 500 amperes or 1200 amperes with equal efficiency.

Cells occupy less than 11 sq. ft. of floor space including aisles per 1000 cell amperes.

Cell series delivering 99% of the theoretical amount of caustic soda.

Untreated anodes in continuous service for more than 400 days.

Paper diaphragms after 100 days' service still operating at over 94% current efficiency.

Paper diaphragms costing less than two dollars, delivering over five tons of caustic soda.

Chlorine better than 94% purity and containing less than 0.02% hydrogen.

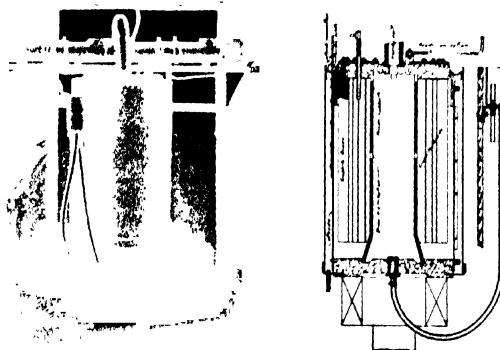
Highest efficiency obtained without the use of steam in the cells.

Cell Room is free of chlorine gas, alkali dust or other annoyances.

Evaporator tubes in continuous service for more than three years.

Dry bleach chambers delivering 37% available chlorine in the bleaching powder the year around.

Caustic finishing furnaces requiring less than 1000 pounds of coal per ton of finished caustic.



**THE WHEELER CIRCULAR CELL**

# BLAW-KNOX COMPANY

Manufacturers of Steel Products

MAIN OFFICE AND WORKS: BLAWNOX (PITTSBURG), PA.

New York, 165 Broadway  
Chicago, Peoples Gas Building  
San Francisco, Monahock Building  
Boston, Little Building

## BRANCH OFFICES

Detroit, Lincoln Building  
Baltimore, Bayard and Warner Streets  
Kansas City, Interstate Building  
Birmingham, Ala., American Trust Bldg

## PRODUCTS

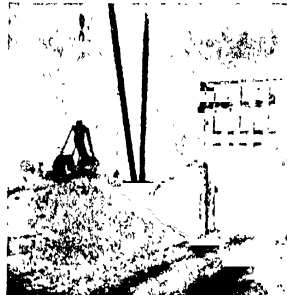
Prudential Steel Buildings (Sectional)  
Buckets (Clamshell)  
Steel (Fabricated)  
Plate Work  
Furnace Appliances (Patented)  
Transmission Towers  
Forms (Steel)  
McKune System of Open Hearth Furnace Construction  
Sheldon Mechanical Gas Producers

## SERVICE

Blaw-Knox Service is a part of every Blaw-Knox product. The engineering skill and experience brought to bear upon individual problems insure the adaptation of every Blaw-Knox product to meet the specific need of the customer.

## BLAW CLAMSHELL BUCKETS

**The Single Line**—Blaw Single Line Buckets will operate on any single drum hoist or crane. They can be hooked on or off the crane or hoist at a moment's notice, thus releasing the hoist for other duty, without the delay necessitated by reeving or they can be reeved direct to the hoist. Single Line Buckets are suitable for rehandling loose bulk materials and will stand up under unusually severe service.



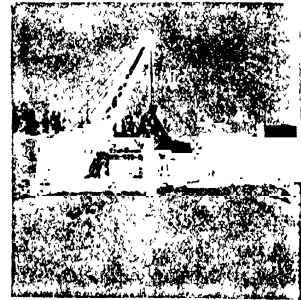
BLAW SINGLE LINE CLAM-SHELL BUCKET

GENERAL DIMENSIONS OF BLAW-KNOX "HOOK ON" TYPE OF SINGLE LINE BUCKET. ALL BUCKETS EQUIPPED WITH GUIDE SHEAVES EXCEPT "OPEN HEAD" TYPE.

Size No.	Rated size cu yds	Wgt lbs	Height open	Scoop Spread		Width	Operating Head Room* when reeved internally		Description
				Open	Closed		2 p't's	3 p't's	
305	1/4	2000	6'-4 1/2"	5'-0"	4'-11 1/2"	2'-11 1/2"	12'-8 1/2"	15'-7"	Standard
310	3/4	2700	7'-6"	6'-6"	4'-8"	3'-2"	14'-3"	18'-2"	Standard
310W	1	3200	7'-6"	6'-0"	4'-8"	4'-2 1/2"	14'-5"	18'-2"	Extra wide
311	1 1/4	2675	6'-10"	6'-0"	4'-8"	3'-2"	9'-0"	12'-9"	Open head
311W	1 1/4	3350	6'-10"	6'-0"	4'-8"	4'-2 1/2"	9'-0"	12'-9"	Open head extra wide
315	1	3700	8'-10"	7'-5"	5'-7"	3'-3"	16'-3"	20'-6"	Standard
316	1	4050	8'-10"	7'-5"	5'-7"	3'-3"	16'-3"	20'-6"	Extra heavy scoops
325	1 1/2	4250	9'-2"	8'-0"	5'-10 1/2"	3'-3"	16'-3"	20'-4"	Narrow type
320	1 1/2	5100	9'-2"	8'-0"	5'-10 1/2"	4'-0"	19'-4"	24'-3"	Standard
321	1 1/2	6100	9'-2"	8'-0"	5'-10 1/2"	4'-0"	19'-4"	24'-3"	Extra heavy scoops
323	1 1/2	5600	8'-4 1/2"	8'-0"	5'-10 1/2"	4'-0"	11'-7"	16'-6"	Open head type
327	1 1/4	5900	9'-2 1/2"	8'-0"	5'-10 1/2"	4'-7 1/2"	19'-4"	24'-3"	Standard
328	1 1/4	6400	8'-4 1/2"	8'-0"	5'-10 1/2"	4'-7 1/2"	11'-7"	16'-6"	Open head type
330	2	10500	10'-10"	9'-0"	7'-1"	4'-8"	21'-3"	26'-0"	High power extra heavy scoops
333	2	9200	10'-10"	9'-0"	7'-1"	1'-8"			High power Standard scoops

\* This is the distance which bottom of bucket measures below hook after dumping. There is somewhat less clearance needed for loaded bucket.

**The Speedster**—The Blaw Speedster Bucket is the fastest rehandling bucket made. It is especially designed for economically rehandling loose bulk material such as sand, coal, gravel cinders, granulated slag, etc., as it enables the operator to obtain the greatest yardage from a derrick or crane.



BLAW SPEEDSTER BUCKET

**The Dreadnaught**—The Blaw Dreadnaught is the most highly developed digging clamshell on the market. It is a straightforward development of the widely favored lever arm type of bucket, combining great closing power with very few moving parts. The Dreadnaught line consists of stock sizes from 3/4 yd. ratings up to 5 yds. and larger and covers all requirements for operating on derricks, cranes, monorails, dredges and special hoists. It will dig earth, bank sand and gravel, plastic and tough clay in the dry or under water. It is very efficient in handling a variety of dry granular materials, acid phosphate, heavy ores, etc.



BLAW DREADNAUGHT BUCKET

The Blaw-Knox line of Clamshell Buckets, in addition to the types mentioned above, includes the Blaw Bulldog—designed especially for heavy quarry and steel mill service; the Blaw Power Wheel a general service bucket of unique design; the Blaw Collier for rehandling light, loose bulk materials; the Foundry Type a single line bucket requiring minimum head room; the Bridge Type built for use on cableways and inclined trolleys; the Blaw Fourline designed for use on crane and bridge trolleys; Blaw Automatic Single Rope Cableways and Blaw Holding Drums.

## THE BLAW BUCKET MANUAL

A handbook for engineers is now ready for distribution. This book contains 72 pages of detailed information about clamshell buckets and is illustrated with photo-engravings and line drawings. A copy will be sent free upon request.

## FORGE AND HAMMER WELDING

### What is Hammer Welding?

Forge and hammer welding is the uniting of two pieces of weldable iron or steel by means of heating

*Continued on Next Page*

and hammering. Whenever one or the other is omitted, a true weld is not obtained. The following conditions present a short synopsis of the hammer welding process:

**First**—The Steel is heated with a water gas flame and the burners are applied from two sides. This insures all parts of the steel becoming molten at practically the same time.



HAMMER WELDED OIL CRACKING STILL

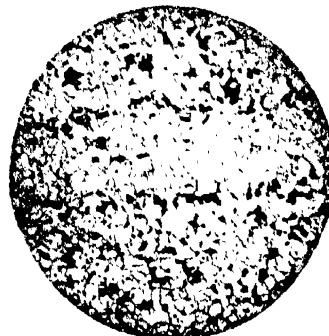
**Second**—The burners are large and do not restrict the heating to a narrow zone of metal. The plate attains a temperature of above 1500°F. for a considerable distance on each side of the weld.

**Third**—When the welding temperature is obtained, the burners are rapidly withdrawn and replaced with pneumatic hammer and anvil. The force of the blow is regulated from light to heavy. The hammer blow is very light and quick at the beginning and increases in weight as the metal gradually becomes colder. This hammering accomplishes two things: first, it draws the metal out from double thickness (due to lapping) to the original thickness of the plate. In so doing, the metal is joined together and the length of the weld is ordinarily from four to six times the thickness of the plate. Second, due to the high temperature of the steel for welding, the structure is changed and the hammering restores the fibrous structure of the steel. The hammer blows break up the large grains and the final plate involved in the weld (because it is worked more) assumes a compact structure which may be even better physically than the remainder of the shell. After the welding has been completed, every piece is subjected to thermal after treatment (annealing). This insures the removal of any stresses which have been set up in the metal due to welding. This requires very large and special annealing furnaces.

#### Water Gas

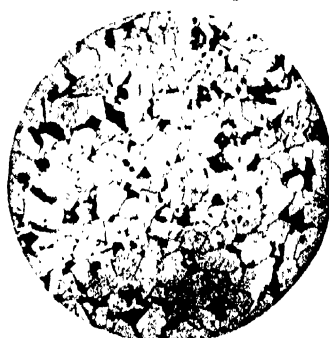
Water gas is used for heating. First, because only 2 cu. ft. of air is required to burn each cubic foot of gas. It is, therefore, very easy to obtain a non-oxidizing or reducing flame. Second, the flame temperature is about 3400°F. This is high enough above the melting point of steel to enable a welding temperature to be obtained quickly, but at the same time it is low enough to minimize the danger of burning the steel. Third, the gas is made in our own producer plant and is free from any impurities.

The water gas flame completely surrounds the metal being welded and thereby prevents any possibility of oxidation while the weld is being made.



98135-D—MICRO-PHOTO OF PIECE OF STEEL WELDED BY BLAW-KNOX FORGE AND HAMMER WELDING PROCESS

Enlarged 100 diameters. Note the perfect joining of the metal, also that the large grains have been broken up and a more compact structure is obtained due to the hammering.



98136-A—MICRO-PHOTO OF NORMAL STEEL ENLARGED 100 DIAMETERS

Note large crystalline structure

#### The Personal Element

The personal element does not enter into hammer welding, as will be noted in the following discussion. The water gas flame prevents any impurities or scaling of the welding surfaces; the flame temperature is low so that there is not the danger of burning the steel; the anvil and hammer being mechanically operated, the perfectness of the weld is not dependent on the physical strength of the operator. Owing to these conditions, uniform welding is obtained and we are able to guarantee an efficiency at the weld of 90 to 95 per cent. of the original strength of the plate.

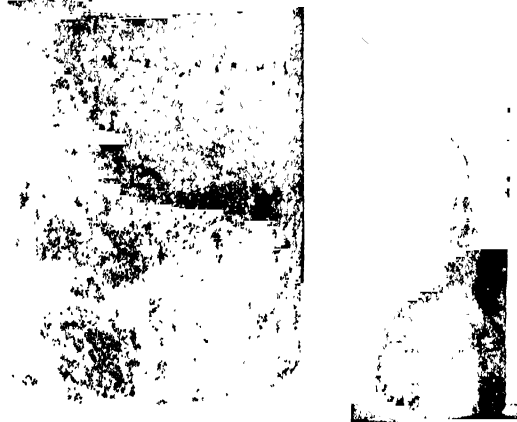
#### Reason for Hammer Welding

In many branches of manufacture to-day, circular or rectangular boxes, tanks or pressure vessels are required to withstand wide variations in pressure and temperature, or a combination of both, and at the same time to remain absolutely leakless. Steel or iron castings are unsatisfactory as there is a constant danger of cracking and also leakage due to blow holes, sand holes and other inequalities in the structure of the metal. Riveted steel plate can be made practically tight at the beginning, but the constant expansion and contraction soon loosens the grip of the rivets and is a constant source of trouble. With forge and hammer welded equipment there are no joints as the welds are so perfect that the structure can be considered one piece of steel.

**Limitations**—The sizes of forge and hammer welded equipment are limited only by transportation facilities and the sizes of plate rolled by the steel mills. The largest diameter of tank which can be handled by the Railroad is about 10 ft. 6 in. Tanks as long as

*Continued on Next Page*

140 ft. may be shipped. Our bending rolls are of special design and all circular work is rerolled after welding. At the present time we are able to weld any plate between  $\frac{3}{8}$ " and  $1\frac{1}{2}$ " thick



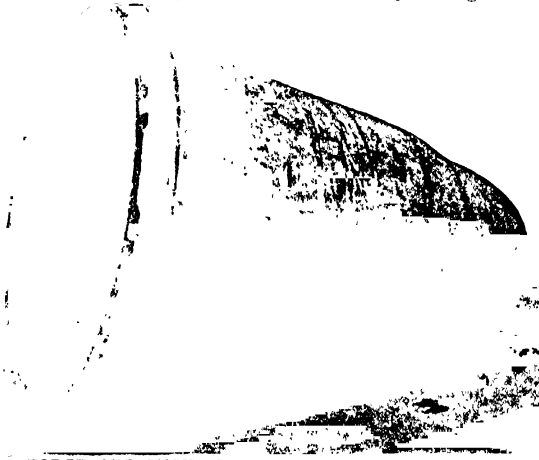
**FORGE AND HAMMER WELDED SHAPES**

**Uses**—Practically every manufacturing field has use for forge and hammer welded work. As there are so many types of equipment, only a few are given below, but they will naturally suggest other uses in your particular field.

Air and Gas Receivers	Oil Filters
Boiler Parts	Oil Cracking Stills
Carbonic Acid Gas Tanks	Ice Machine Parts
Chemical Plant Parts	Absorber Shells
Acid Eggs	Ammonia Receivers
Boiling Kettles	Condenser Shells
Crystallizing Pans	Lead Melting Pots
Digesters	Varnish Kettles
Jacketed Kettles	Vulcanizing Cylinders
Mixed Acid Tanks	Wood Creosoting Cylinders
Nitric Acid Tanks	Wood Pulp Digesters
Sulphuric Acid Tanks	Steam and Fire Stills
Galvanizing Pans and Kettles	High Pressure Water Pipe
	Gasoline Tanks

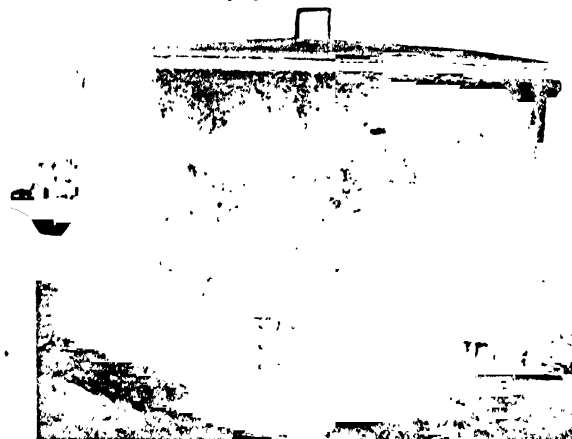
#### **OXY-ACETYLENE AND ELECTRICALLY WELDED PLATE WORK**

There is an ever increasing demand for Oxy-Acetylene and Electrically welded chemical equipment. This is due to the fact that many new chemical processes being developed and old processes being improved, have for their success been found to depend on high pressures and high temperatures. Operating safety

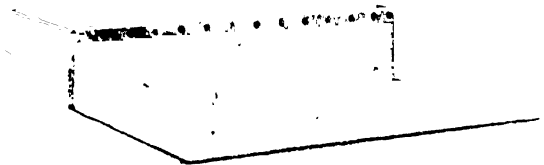


**FORGE AND HAMMER WELDED PITCH COOKING POT**

as well as prevention of losses of valuable liquids and gases during processing is obtainable by means of welded high-test equipment.



**OXY-ACETYLENE WELDED TANK**



**OXY-ACETYLENE WELDED TERNE POT**



**RIVETED STEEL TANKS**

#### **RIVETED PLATE WORK**

We have specialized for years in riveted plate work that meets every requirement of the chemical industry. The equipment we have built has covered every conceivable design of steel equipment of this class. When plans are submitted to us for quotations engineers can feel assured that we will give the best price commensurate with the thoroughness and reliability of the work produced by this organization.

Our engineers are always ready to consult with prospective clients, with regard to the best type of plate work for the conditions to be encountered. There are many operating conditions where riveted steel is more satisfactory than welded or forged equipment.

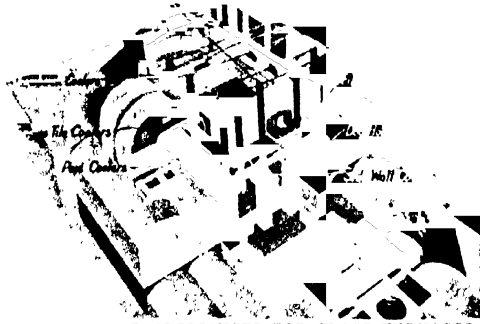
#### **WATER COOLED APPLIANCE FOR GLASS FURNACES**

Blaw-Knox Water Cooled Appliances increase the life of Glass Tanks and Furnaces and enable them to

*Continued on Next Page*

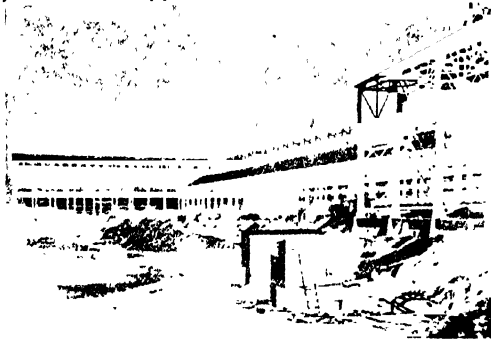


hold their original outlines throughout their run. Greater production and better quality of glass are insured through the use of these coolers; the size of furnace walls can be reduced and heavy, bulky bricking eliminated. Send for catalog covering these products in detail.



**WATER COOLED APPLIANCES FOR GLASS FURNACES  
FABRICATED STEEL CONSTRUCTION**

Blaw-Knox engineers have established a reputation as builders of products of merit. Their services and the facilities of a fully equipped and commodious fabricating shop are at your disposal in designing and fabricating mill buildings, manufacturing plants, bridges, steel poles, transmission towers, crane runways, and other types of fabricated steel construction.



**FABRICATED STEEL BUILDING CONSTRUCTION  
STEEL FORMS FOR CONCRETE CONSTRUCTION**

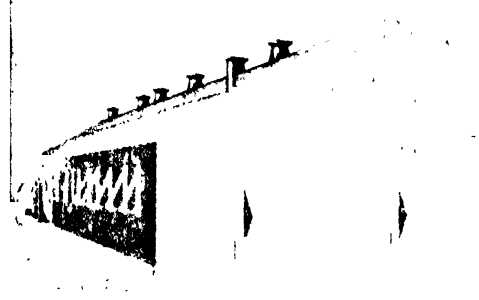
Heavy retaining walls, light walls and foundations, sewers, conduits of any character, columns, floors, roofs, roads, pavements, curbs and gutters, can all be built with greater speed, larger economy and materially better finish through the use of Blawforms. *There is a Blawform for every use.*



**STEEL FORMS FOR CONCRETE**

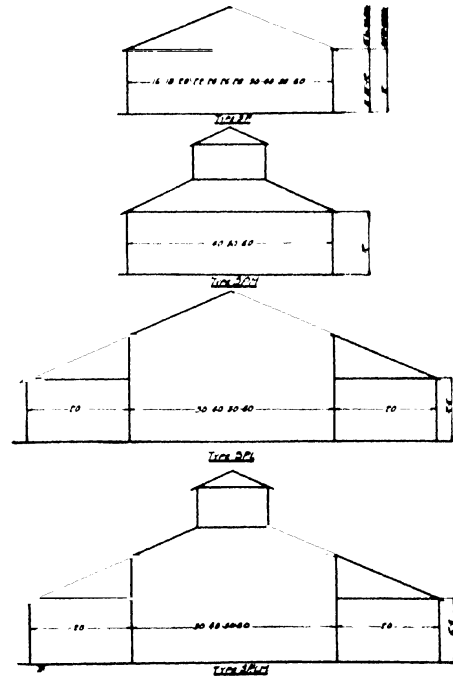
## PRUDENTIAL SECTIONAL STEEL BUILDINGS

These buildings are manufactured in widths from 8 to 60 feet single span and in any length. They are carried in stock and can be shipped in a single shipment, which places the complete building on the job and ready for erection without the worry consequent



**PRUDENTIAL SECTIONAL STEEL BUILDING**

of placing a variety of orders for accessories which is the natural course of events when other types of buildings are contemplated. Heavy, galvanized, specially pressed steel sheeting is used for side walls and roof. The frame is of fabricated construction. All parts fit perfectly. Doors, windows or steel sash, ventilators and skylights may be located at will as the sheets are interchangeable. The sheets are fitted with special interlocking devices and there are no punched holes in side wall or roof sheets. The diagrams below illustrate various types and sizes of Blaw-Knox Sectional Steel Buildings. The line also includes "Quixet" All Steel Garages in single, double and multiplex designs and "Handy Houses" for all purposes. A special catalog fully describes and illustrates the entire line.



**CROSS SECTIONS OF PRUDENTIAL STEEL BUILDINGS WITH AND WITHOUT LEANTOS AND MONITORS**

# CHARLES BOND COMPANY

## Manufacturers of Power Transmission Machinery

### 617-619 ARCH ST., PHILADELPHIA, PA.

#### AFFILIATED COMPANIES

Bond Engineering Works Limited, Toronto, Can.  
Bond Foundry & Machine Company, Manheim, Pa.

Christiana Machine Co., Christiana, Pa.  
J. & G. Rich Co., 120-122 N. Sixth St., Philadelphia, Pa.

#### PRODUCTS

##### Grundy Patent Flexible Couplings. Power Transmission Equipment.

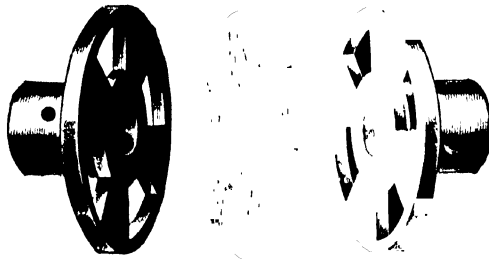
Hangers	Boxes
Pillow Blocks	Bearings
Floor Stands	Journals
Girder Clamps	Collars
Couplings	Friction Clutches
<b>Leather Belting</b>	<b>Textile Specialties</b>

##### GRUNDY PATENT FLEXIBLE INSULATED COUPLING

This coupling is constructed of three pieces, two outer flanges of cast iron and a center disc of non-conducting material, with lugs on each side for transmitting the power to the outside flanges.

The central disc is made of specially selected leather, with lugs securely cemented and riveted to each side of the disc.

The larger sizes, Nos. 12 to 30 inclusive, have lugs cemented and bolted on and reinforced with steel plate.



Cast Iron Leather Cast Iron  
**FIG. 77. GRUNDY COUPLING TAKEN APART**

The discs supply the insulation while the lugs on each side transmit the power to outside flanges. The leather lugs are cut on a bias, tapering towards the disc; the cast iron driving flanges being machined with a corresponding taper, have a tendency to draw the flanges close to the disc, and to cause the leather lugs to receive and transmit the power at their strongest points.

The close connection made possible by this style of coupling reduces to a minimum the leverage, which is so objectionable on the old style pin couplings.

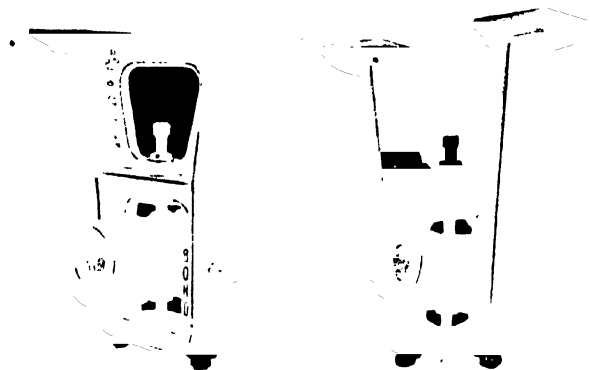
Where it is not possible to get perfect alignment of shafts, this coupling will adjust itself to circumstances.

Give the following information when making inquiries regarding the Grundy coupling:

Horsepower required; revolutions per minute, diameter of driving shaft and size of keyway, diameter of receiving shaft and size of keyway; whether couplings are to be set screwed; whether conditions under which the coupling is to operate are dry or subject to moisture; whether load is constant (if not, write fully regarding intermittent character of same); description of connection for which coupling is to be used.

#### POWER TRANSMISSION EQUIPMENT

We are prepared to furnish everything required in the line of hangers, couplings, etc., required for the transmission of power to machinery. We also manufacture high class leather belting.

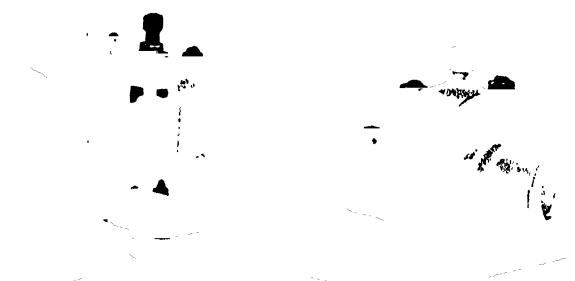


**FIG. 1. BOND PATENT UNIVERSAL DROP HANGER**

A good rigid hanger, with provisions for free movement in bearing for shaft to revolve. Metal is equally distributed in order that there will be sufficient amount where the greatest strain takes place.

**FIG. 17. BOND SCIENTIFIC "LYESTRONG" STEEL SHAFT HANGER**

Folded into shape from sheet metal, without breaking the fiber, insuring greatest strength and rigidity.

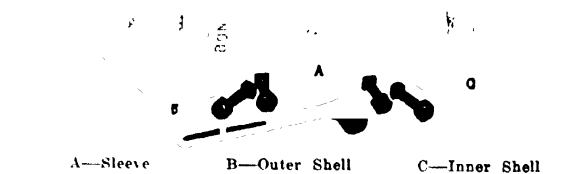


**FIG. 4. BOND UNIVERSAL POST HANGER**

Bearings babbitted and reamed. Fitted with ring oiling bearings, ball and socket adjustment.

**FIG. 6. "BOND" PEDESTAL PILLOW BLOCK**

Fitted with ring oiling bearings, ball and socket adjustment. Bearings babbitted and reamed.



**FIG. 42. "BOND" PATENT "SPIRO" COMPRESSION COUPLING**

The spiral slot in sleeve makes the Bond a perfect coupling giving a "Double-sure" grip the entire length and circumference of the sleeve. A trial order will convince you of its superiority.

## JOHN BOYLE & CO., INC.

Established 1860

112-114 Duane Street  
70-72 Reade Street  
NEW YORK

BRANCH HOUSE  
202-204 Market Street  
ST. LOUIS

### PRODUCTS: Filter Cloth in a Great Variety of Weaves

Suitable for All Branches of the Chemical Industry:

Cotton, Wool, Linens, Silks in Rolls also cut and made up to fit any make of Filter Press.

### COTTON.

In rolls of about 100 yards, in widths from 14 to 120 inches.

### WOOL AND CAMEL'S HAIR.

In rolls of about 50 yards, widths from 6 to 84 inches. Used to resist alkali and acids.

### LINENS.

In rolls of about 25 yards, widths from 22 to 28 inches.

### SILKS.

In rolls of about 20 yards, widths from 14 to 40 inches.

### SERVICES:

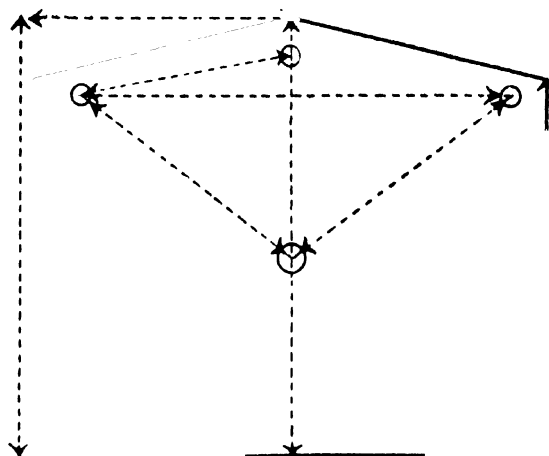
Our experience of years and equipment for making up cloths enables us to properly manufacture them so they snugly fit the plates of your press and thereby obviate the loss of cloths through their being wrinkled on the presses and causing the plates to cut and ruin the fabric when the plates are closed and pressure put on, as is generally the case where cloths are made up without proper care and to a template.

### MADE UP CLOTHS:

We make up cloths to fit your presses.

Send us Blueprint Pattern cloth or measurements of your press together with information regarding material you wish to filter and we can furnish not only the right kind of cloth for your purpose but also ones fitted to your particular press.

### MEASUREMENTS REQUIRED:



SKETCH INDICATING REQUIRED MEASUREMENTS

Sketch shows the measurements we require for this particular type of press and will give you an idea as to what measurements we need in order to furnish you with cloths to fit any style of press.

### TRIAL ORDERS REQUESTED:

Give us an opportunity to furnish you with a few cloths in order that we may demonstrate why we are selling most of the largest firms in the various industries.

# THE JAS. A. BRADY FOUNDRY COMPANY

Chemical Castings in Gray Iron

Western Boulevard at 45th Street, CHICAGO, ILLINOIS

## PRODUCTS

Special Equipment used in the Chemical Industries  
including Gray Iron and Special castings for:

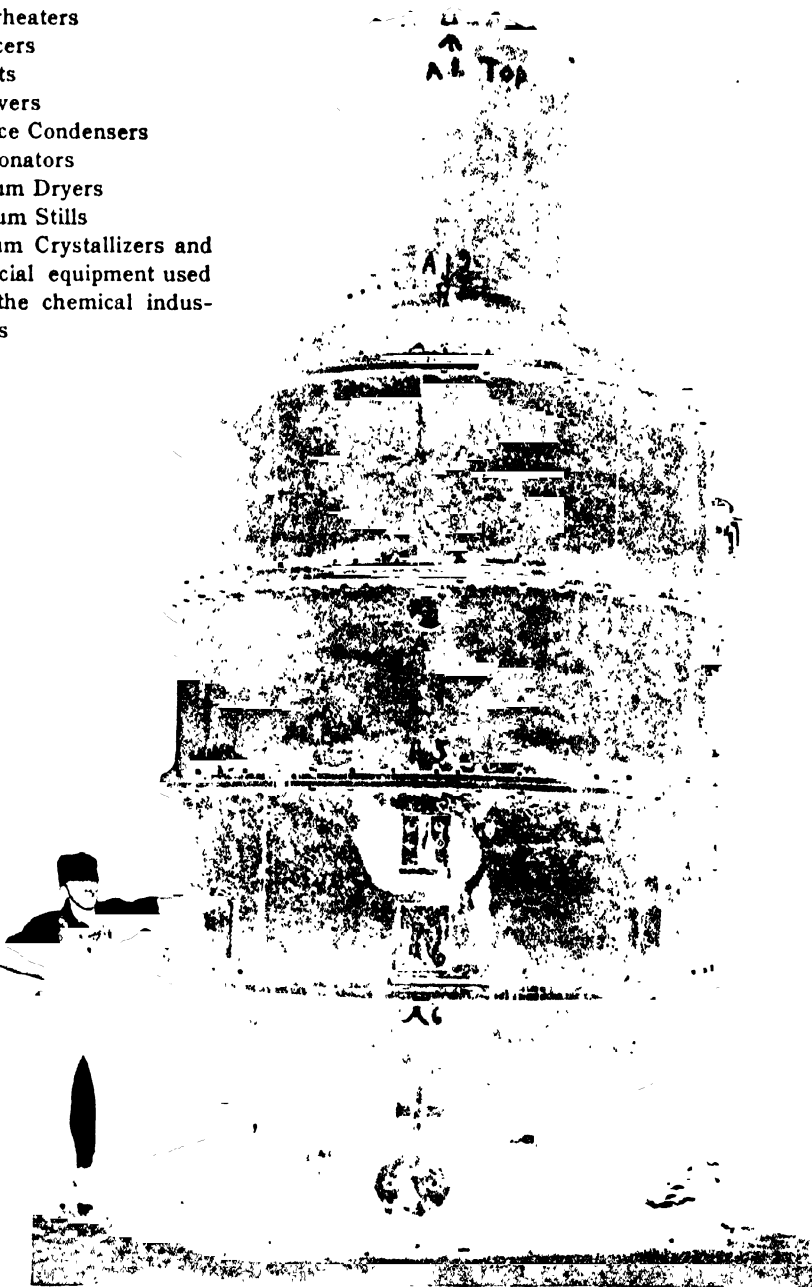
Acid Eggs	Naphtha Stills
Autoclaves	Nitrators
Barometric Condensers	Superheaters
Concentrators	Reducers
Caustic Pots	Retorts
Crystalizing Pans	Receivers
Denitrators	Surface Condensers
Drum Dryers	Sulphonators
Evaporators, in single and multiple effect	Vacuum Dryers
Expansion Tanks	Vacuum Stills
Extractors	Vacuum Crystallizers and special equipment used in the chemical indus- tries
Filters	
Fusion Kettles	

## FACILITIES

This company operates one of the best equipped foundries in the vicinity of Chicago for pouring, handling, and shipping heavy chemical castings. Owing to the character of the work handled by this firm, only the highest grade of gray iron and special mixtures are used. All daylight modern buildings invite the best of workmanship.

## CASTINGS

The accompanying illustration represents one of the many castings made by the James A. Brady Foundry Company. This casting is 18 feet 9 $\frac{3}{4}$  inches high; each ring section is 3 feet high. The metal is 1 $\frac{1}{2}$  inches thick and each section weighs 6000 pounds. This casting was made for William Garrigue & Co. for chemical plant use and has a capacity of 1000 pounds of fatty acid per hour.



THIS CASTING REPRESENTS THE WORK WE HANDLE

# BRIDGEPORT BRASS CO. "Bridgeport"

Seamless Tubing  
BRIDGEPORT, CONN.

## PRODUCTS

Brass, Bronze and Copper Seamless Tubing, Sheets, Rods and Wire.

Brass, Muntz Metal and Admiralty Condenser Tubes.

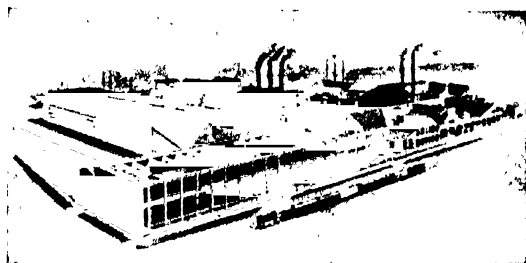
Stamped brass, copper or bronze pans, trays and parts of all descriptions.

Brass screw machine products in all sizes,  $\frac{1}{4}$  inch to  $1\frac{1}{2}$  inches diameter.

## BRIDGEPORT BRASS

**An Electric Furnace Product**—All Bridgeport brass, as well as Bridgeport bronze, is made in electric furnaces, insuring a uniformity and reliability of properties not otherwise commercially obtainable. For more than fifteen years this company has worked on the development of improved methods of making brass and has developed material improvements in electric furnace processes, which eliminate uncertainty from the process of melting and casting.

**Advantages of the Electric Furnace**—With the Bridgeport electric process, positive control of temperature is assured at all stages of the melting process, which means that all processes occur at exactly the proper temperatures to insure the best product for the job—be it sheet, rod or tube. Moreover the heating is under perfect control, and can be adjusted at any time to any rate desired. There are no furnace gases to contaminate the metal in the Bridgeport electric process, thus preventing the introduction of undesirable impurities. The charge is completely enclosed so it does not come into contact with the atmosphere.



CASTING SHOP, ROLLING AND TUBE MILLS OF THE BRIDGEPORT BRASS CO.

The heat insulation is perfect, preventing waste of heat by radiation and improving the working conditions of the men who observe the process of melting and control the pouring. The operator has perfect control of the pouring rate through a leverage mechanism permitting him to vary the pouring accurately and as slowly as he wishes without risk of molten metal cooling down in the furnace while pouring.

## PHYSICAL PROPERTIES OF BRIDGEPORT BRONZE

Diam. or thickness in inches	Tensile Strength lb per sq. in	Yielding point—lb per sq. in	Elongation in 2 inches (per cent)
Up to 1" inclusive	62,000	31,000	25
Over 1" to 2 $\frac{1}{2}$ " inclusive	60,000	30,000	30
Over 2 $\frac{1}{2}$ " to 3 $\frac{1}{4}$ " inclusive	56,000	25,000	35
Over 3 $\frac{1}{4}$ "	54,000	22,000	40

## SEAMLESS TUBING

The tube mill is remarkable on account of the fact

that most of its equipment was developed in the plant by the Bridgeport Brass Company's organization. The quality of the tubes is maintained within very close limits on account of the electric furnace processes used in casting the metal as well as by the studied precision of the methods employed in the tube mill. The life of a tube is largely dependent upon the manufacturing procedure and it was with these points in mind that dies, lubricants, annealing temperatures and other factors which enter into the process were chosen.

## BRIDGEPORT SEAMLESS ADMIRALTY—BRASS AND MUNTZ METAL CONDENSER TUBES

Tube Gauge No Thickness, in. or less Outside diameter in inches	Sizes and Weights per Foot				
	16 .065	17 .058	18 .049	19 .042	20 .035
$\frac{1}{8}$	4.20	3.80	3.26	2.81	2.48
$\frac{1}{4}$	5.14	4.63	3.96	3.43	2.89
$\frac{3}{8}$	6.08	5.47	4.67	4.04	3.39
1	7.0	6.3	5.4	4.6	3.9

All Bridgeport tubing is seamless and can be bent to any radius without danger of splitting. Therefore, it is specially suited for use in the construction of heating and cooling coils, tube evaporators, condensers, still coils and miscellaneous piping. Bridgeport brass and bronze tubing is furnished in lengths from 2 to 25 feet, and diameters from  $\frac{1}{4}$  to  $5\frac{1}{2}$  inches by eighths.

## LABORATORY AND RESEARCH DEPARTMENT

The processes of the Bridgeport Brass Company have been placed on a thoroughly scientific basis through the careful organization of a research laboratory. The work of this department is divided into two parts: the research work and the control routine work.

**Research**—The research work divides itself into two general classes: namely, work on products of the company and work on materials and equipment employed by the company in the manufacture of its products. The research department develops new alloys, studies details of the manufacturing processes with a view to eliminating wastes, and improving the quality of the product.

**Control**—The control laboratory systematically samples the product at the various stages of manufacture and performs chemical analyses and certain physical tests, depending on the nature of the product and the particular step in the process from which the sample was taken. In this way, it is possible to control closely the properties of the products passing through the plant. The control laboratory is specially valuable in protecting the various alloys from any impurities that might occur in the ingredients used in their composition.

The Research Department has recently developed methods of making instantaneous tests for measuring certain ingredients in copper alloys. The simplicity of these tests is so great that the company has adopted the practise in some classes of work of testing every heat. In fact, the method is so expeditious that in case a mixture should for any cause be open to question, it is possible to pour a small sample and hold it in furnace until the tests are completed. Then if corrections are necessary they can be made before the furnace is poured.

# THE BRISTOL COMPANY

## WATERBURY, CONN.

Boston  
Old South Bldg

New York  
114 Liberty Street

Pittsburgh  
Frick Bldg

BRANCH OFFICES

Detroit  
Book Bldg

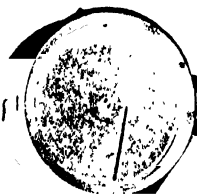
Chicago  
Marshall Bldg

St. Louis  
Boatmen's Bank Bldg

San Francisco  
Rialto Bldg

### PRODUCTS

Bristol's Recording Pressure, Vacuum, Draft and Combination Gages; Liquid Level Gages; Recording Thermometers; Thermometer-Thermostat; Recording Psychrometers; Indicating and Recording Pyrometers; Electric Temperature Regulators; Recording Voltmeters; Recording Milli-Voltmeters; Recording Ammeters; Recording Shunt Ammeters; Recording Wattmeters; Recording Frequency Meters; Recording Tachometers; Electrical and Mechanical Time Recorders; also, Bristol's Long Distance Electric Transmitting System; Bristol Counters and Bristol-Durand Radii Averaging Instruments.

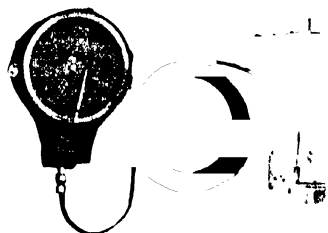


RECORDING GAGE

### BRISTOL RECORDING PRESSURE AND VACUUM GAGES

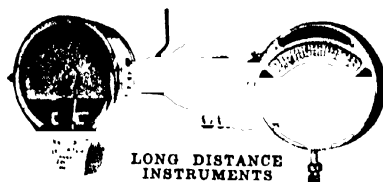
For securing continuous records of pressure or vacuum. For steam, air, gas and liquids. Charts furnished to read in pounds, ounces, inches, feet, metric or any desired unit. For ranges from full vacuum to 12,000 pounds per sq. in. Complete information Catalog AB-1005.

### BRISTOL'S RECORDING LIQUID LEVEL GAGES



RECORDING LIQUID LEVEL GAGE

### BRISTOL'S LONG DISTANCE ELECTRIC TRANSMITTING AND RECORDING SYSTEM

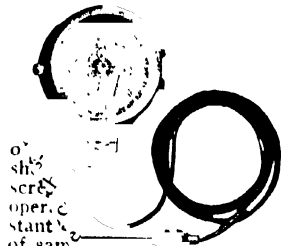


LONG DISTANCE INSTRUMENTS

For automatically recording depths or levels of water or other liquids, in tanks, water towers, reservoirs, etc. Instrument can be located where most convenient at a higher or lower level than the liquid to be measured.

may be transmitted over distances of five miles or more.

### BRISTOL'S RECORDING THERMOMETERS



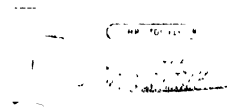
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RECORDING THERMOMETER

For all commercial ranges from  $-60^{\circ}$  to  $+800^{\circ}$  F. Furnished with plain bulbs for use in open spaces like dry kilns, etc. Bulbs with union and screw connections are supplied for recording temperatures of liquids in close spaces under pressure, such as boiler feed water, superheated steam, milk pas-

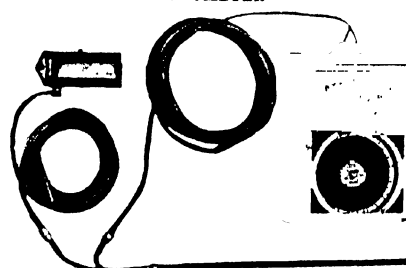
teurizers, etc. For detailed information see Catalogs AB-1102-1202-1302

### BRISTOL'S INDICATING AND RECORDING ELECTRIC PYROMETERS



INDICATING PYROMETER

High Resistance Model 319 for ranges up to 3000 degrees Fahr. used with platinum couples.

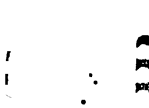


COMBINATION UNIT OF ELECTRIC PYROMETER

Combination Indicating and Recording Unit of

Bristol's Pyrometers furnished where it is desirable to have Indicating Instrument at operators' station and a Recording Instrument for the superintendent in his office.

### BRISTOL'S ELECTRIC TEMPERATURE CONTROLLER



TEMPERATURE CONTROLLER

Thermo-Electric Type with automatic electric valves for controlling temperatures in gas, oil and electric furnaces. See Bulletin AB-289.

### BRISTOL'S STRIP TYPE RECORDING WATTMETER



BRISTOL'S STRIP TYPE RECORDING WATTMETER

Portable Model for use on poly-phase or single-phase alternating current. Convenient and practical for carrying about to make tests or to obtain records of consumption of electrical energy. For full data see Catalog AB-1500.

### BRISTOL'S OPERATION RECORDER

For recording time of mechanical movements, machine operation, valve reversals, etc.

This Strip Type Electric Time Recorder is designed to record as many as 20 different operations on one chart.

The instrument is easy to install. There are thousands of requirements for this operation recorder in manufacturing plants. For details see Bulletin AB-207.



ELECTRIC TIME RECORDER

# BROOKLYN FIRE BRICK WORKS

Manufacturers of High Grade Refractories

GENERAL OFFICES

91 Van Dyke Street  
BROOKLYN, N. Y.

Telephone HENRY 117  
114

## PRODUCTS

Fire Brick  
Special Shapes  
Fireseal High Temperature Fire Cement  
Fire Clay

### BROOKLYN PATENTED SUSPENDED FURNACE ARCH, FLAT OR CURVED, SLOPED OR STEPPED, UPWARD OR DOWNWARD

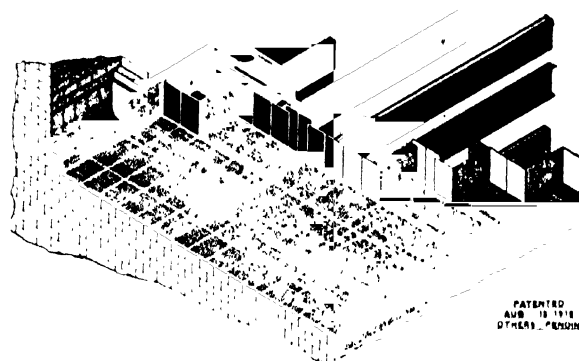
We are the sole manufacturers of this Suspended Furnace Arch for all types of Stokers, including underfeed, Traveling Cham Grates or V. Types.

The Suspended Furnace Arch is also adapted to incinerators, Dutch Ovens, Destructors, as well as for Preheating, Reduction, Drying, Chemical, Metallurgical or special furnaces of every description.

**Mechanical Advantages**—It is stronger, more accessible, and durable. It is easier and quicker to repair and has fewer parts.

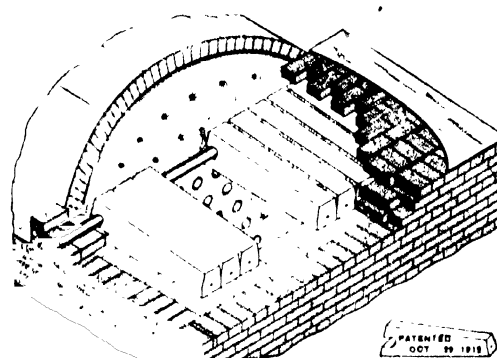
The patented rounded hanger and slot distributes the load properly and eliminates splitting of the blocks.

The key blocks permit making all repairs from the under side of the arch. Once the top is built it need never be removed.



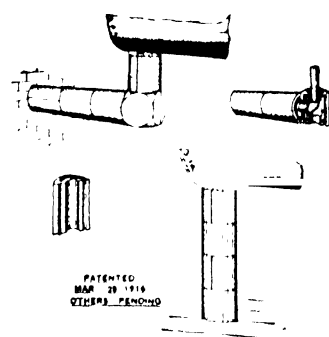
SUSPENDED FURNACE ARCH

PATENTED  
AUG. 18 1918  
OTHERS PENDING



BACK CONNECTION ARCH

PATENTED  
OCT. 29 1918  
OTHERS PENDING



BLOW OFF PROTECTOR

PATENTED  
MAR. 25 1919  
OTHERS PENDING

### BROOKLYN PATENTED BACK CONNECTION ARCH

This type of arch is used on all kinds and sizes of Horizontal Tubular Boilers, etc.

**Mechanical Advantages**—It is simplest and best as it requires merely a piece of 2" pipe and a series of blocks of one type.

It is quickly installed by putting the pipe in place and then setting blocks on it as shown in illustration.

Each block is readily removed by inserting a hook in the hole in rear of any block and lifting it out.

No mortar is required, as they are set in dry, and the expansion joints on ends and sides are filled with asbestos.

Air circulation through the pipe keeps it cool. No center hanger is required to counteract sagging from overheating.

### BROOKLYN PATENTED BLOW-OFF PROTECTOR

A series of interchangeable semicircular blocks that interlock in all directions for vertical or horizontal blow-offs.

#### **Mechanical Advantages.**

**Installation Easy**—Set dry without clay. Blocks securely interlocked. Only one type required for vertical pipe. This same type block with combination ell and tee for horizontal pipes.

**Blocks Thick but not Heavy**—They are made from patented mixtures of fire clay that while refractory and highly resistant to spalling are approximately half the weight of ordinary fire brick equivalent.

### SPECIAL SHAPES

This company has for more than sixty years been specializing in the manufacture of difficult shapes. Where the elimination of joints is a vital factor in the length of life of a lining and where, therefore, special shapes are required, those manufactured by us from the widely known and justly famed Jersey and Raritan Clays will be found to give service superior to those made from any other clays.

# BROOKLYN THERMOMETER CO.

Manufacturers

*"Brothcom"*50-56 Garden Street  
BROOKLYN, N. Y.*"Brothcom"*

## PRODUCTS

**"Brothcom" Industrial Thermometers**  
**Barometers, Mercurial and Aneroid**  
**Draft Gauges**  
**Vacuum Gauges**  
**Vacuum Gauges with mercury column**  
**Thermometers**  
 Etched stem  
 Special Precision for checking purposes  
 Laboratory Thermometers for general use  
 All Glass, long stem, all sizes  
**Hydrometers and Thermo-Hydrometers for laboratory and industrial work**  
**Mineral Oil Testing Instruments**  
**Sugar Testing Glassware**  
**Chemical Apparatus for Industrial Laboratories and Scientific Institutions**  
**Porcelainware and Fine Chemicals**

## "BROTHCOM"

This name has been derived from parts of the Company's title and is a guarantee of superior workmanship and careful attention to detail.

## INDICATING THERMOMETERS NO. 1

Industrial type, mercury filled, made with scale reading from 40° below Zero up to 1000° above. Adaptable for all industrial requirements.



## GENERAL REPAIR OF INDUSTRIAL THERMOMETERS

Same repaired in our factory are entirely overhauled and tested—as new ones. Very quick service is offered in this branch of work.

## MERCURY COLUMN VACUUM GAUGES

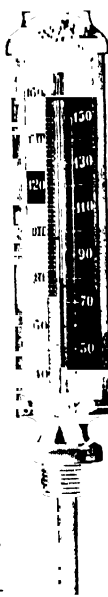
Being made for the close and accurate reading of Vacuum in Steam Plants, where cooking and boiling under vacuum is done.

## THERMOMETERS NO. 2

Precision grade, and made with an Etched stem, whether intended for high or low temperature work are made from carefully selected glass of low coefficient of expansion. These thermometers are furnished with or without Bureau of Standards certificate. These certificates can be had at short notice.

LABORATORY  
THERMOMETER  
No. 2

Laboratory grade, less expensive instrument suitable where frequent breakage occurs. Carefully made. Can also be furnished with open front armored case.



INDUSTRIAL  
THERMOMETER  
No. 1

## "BROTHCOM" THERMO-HYDROMETERS NO. 3

As temperature variations affect the density of the liquid and the volume of the Hydrometer, the temperature at which a determination is made is a very important factor in obtaining a correct result.



THERMO-HYDROMETER  
No. 3

For Opaque liquids, our Thermo-Hydrometer has the Thermometer in top of stem for transparent liquids in the body and in each case is so arranged that the Specific Gravity and temperature reading may be taken together.



INDUSTRIAL  
HYDROMETER

## "BROTHCOM" HYDROMETERS

Laboratory grades have been designed to quickly assume a position of equilibrium in the liquid whose density is required.

To produce this we did away with all resistance offering edges, substituting for the old form of spherical bulb and sharp constructions our superior Arrow Shape finish, thus facilitating Rapid, Accurate reading.

## INDUSTRIAL HYDROMETERS

These are handwritten, their titles indicating the particular liquids for which their use is intended, and are made for Acids, Alkali, Alcohol, Ammonia, Coal Oil, Glue, Spirit, Sugar, Mineral Oil, Syrup, etc.

## "BROTHCOM" LABORATORY APPARATUS

Are of the high type that offer maximum service owing to their durability which comes from using perfect materials in conjunction with high class workmanship. Standard makes of Glass apparatus are always kept in stock for prompt shipments.



SOXHLET  
EXTRACTION  
APPARATUS



# BROOKLYN FIRE BRICK WORKS

Manufacturers of High Grade Refractories

GENERAL OFFICES

91 Van Dyke Street  
BROOKLYN, N. Y.

Telephone HENRY 117  
114

## PRODUCTS

Fire Brick  
Special Shapes  
Fireseal High Temperature Fire Cement  
Fire Clay

### BROOKLYN PATENTED SUSPENDED FURNACE ARCH, FLAT OR CURVED, SLOPED OR STEPPED, UPWARD OR DOWNWARD

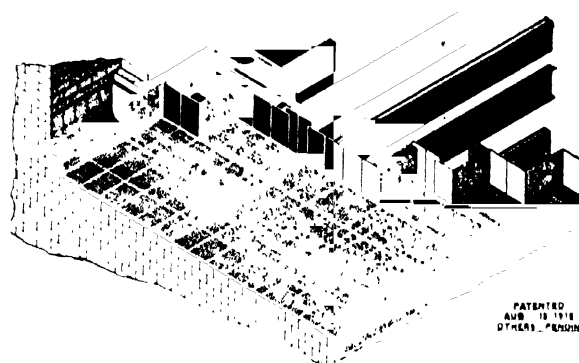
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**Mechanical Advantages**—It is stronger, more accessible, and durable. It is easier and quicker to repair and has fewer parts.

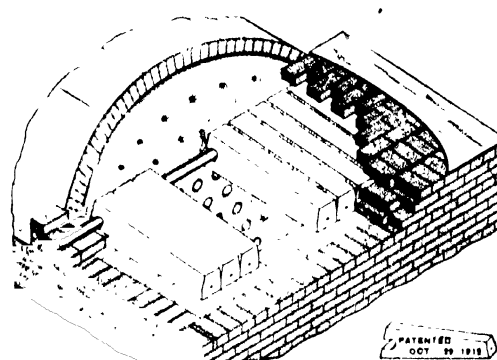
The patented rounded hanger and slot distributes the load properly and eliminates splitting of the blocks.

The key blocks permit making all repairs from the under side of the arch. Once the top is built it need never be removed.



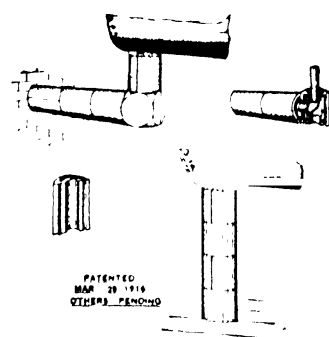
SUSPENDED FURNACE ARCH

PATENTED  
AUG. 18 1918  
OTHERS PENDING



BACK CONNECTION ARCH

PATENTED  
OCT. 29 1918  
OTHERS PENDING



BLOW OFF PROTECTOR

PATENTED  
MAR. 25 1919  
OTHERS PENDING

### BROOKLYN PATENTED BACK CONNECTION ARCH

This type of arch is used on all kinds and sizes of Horizontal Tubular Boilers, etc.

**Mechanical Advantages**—It is simplest and best as it requires merely a piece of 2" pipe and a series of blocks of one type.

It is quickly installed by putting the pipe in place and then setting blocks on it as shown in illustration.

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No mortar is required, as they are set in dry, and the expansion joints on ends and sides are filled with asbestos.

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A series of interchangeable semicircular blocks that interlock in all directions for vertical or horizontal blow-offs.

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### SPECIAL SHAPES

This company has for more than sixty years been specializing in the manufacture of difficult shapes. Where the elimination of joints is a vital factor in the length of life of a lining and where, therefore, special shapes are required, those manufactured by us from the widely known and justly famed Jersey and Raritan Clays will be found to give service superior to those made from any other clays.

# THE BROWN INSTRUMENT COMPANY

Pyrometers, Thermometers and Recording Instruments  
PHILADELPHIA, PA.

## BRANCH OFFICES

New York, 50 Church Street  
Denver, 1742 Champa Street  
San Francisco, 570 Mission Street

Cleveland, Reliance Bank Bldg  
Pittsburgh, Oliver Building  
Chicago, Conway Building  
Montreal, Canada, 414 St. James St

Detroit, Ford Building  
St. Louis, Railway Exchange Building  
Los Angeles, 363 New High Street

## PRODUCTS

Pyrometers; Thermometers; Gauges; Tachometers  
and other Scientific Instruments.

### PYROMETERS

**High Resistance Indicating Type**—For measuring temperatures from 300° to 3000° Fahr. on equivalent Cent.



HIGH RESISTANCE INDICATING PYROMETER

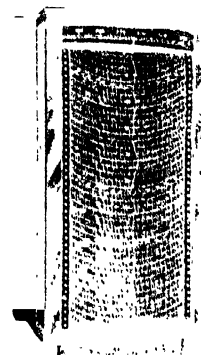
Operates on thermo-electric principle. Entirely unaffected by temperature changes along wire connecting thermocouple to instrument.



RECORDING PYROMETER

Also designed to automatically control or regulate temperatures of electric, gas or oil furnaces.

**High Resistance Recording Type**—Keeps a continuous record, day and night, of temperatures. Eliminates guesswork. Gives executive a check on plant operation.



**Continuous Recording Type**—Makes a continuous record of temperatures over a 2 months' period. It requires only the winding of 8-day clock mechanism once a week. Made in types to record the temperature of 1, 2, 4, 6, 8 or 10 thermocouples in different colors on one chart.

CONTINUOUS RECORDING PYROMETER

**Portable Type**—Made in both high and low resistance types. Height 7 in., width 7 in., depth 4½ in., weight only 6½ lbs.



PORTABLE PYROMETER

### THE NEW BROWN RECORDING THERMOMETER

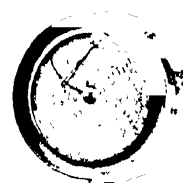
For measuring temperatures up to 800° Fahr. Operates on the principle of expansion of gas or liquid with change of temperature. Tubing can be 100 ft. long. Readings are unaffected by atmospheric changes in temperature along tubing or at instrument. Makes a clear, accurate chart.



RECORDING THERMOMETER

### RECORDING PRESSURE GAUGE

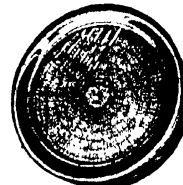
For recording all ranges of vacuum and pressure from a few ounces of water to 3000 lbs. Operate through expansion or contraction of a helical hollow spring for high pressure and a series of diaphragms for lower pressures and vacuums. Positive and accurate.



RECORDING PRESSURE GAUGE

### TIME AND OPERATION RECORDER

Extensively used for recording the time of operation of machinery, switches, valves, pumps and for recording the reversals of glass melting tanks, open hearth furnaces and annealing furnaces. Also for recording the time of starting and stopping of paper machines and other devices.



TIME AND OPERATION RECORDER

### OTHER BROWN INSTRUMENTS

Ammeters; draft gauges, electrical tachometers, mercurial tachometers; mercury gauges; milli-ammeters; milli-voltmeters; recording gauges; temperature controllers; mercurial thermometers; vacuum gauges; voltmeters; differential gauges.



BROWN DRAFT GAUGE



BROWN ELECTRIC TACHOMETER



BROWN MERCURIAL THERMOMETER INDUSTRIAL TYPE

# BROWN PORTABLE CONVEYING MACHINERY CO.

10 SOUTH LA SALLE ST., CHICAGO, ILLINOIS, U. S. A.

Sales Representatives in All Parts of the World

## PRODUCTS

Elevators, Conveyors, Loaders, Unloaders for the Economic Handling of Packed and Loose Materials.

## PILING MACHINES

Designed and built to fit any reasonable condition. Carriages, size, and strength varied to suit local requirements. Practically any commodity provided for. Brown Portable Pilers pile the highest tier as cheaply, quickly and easily as the lowest. Pile up to 30 feet. Eliminate hard work, slowness and time-wasting. Adjustable in height, readily portable, driven by gasoline or electricity—and thoroughly guaranteed.



ONE TYPE OF PILING MACHINE

## "INTERVEYOR"

A system of portable horizontal conveyor sections, combined when necessary with a piling machine, which carry goods of all descriptions any distance—around corners when required—into cars, to the top of the pile or elsewhere. Sections are easily portable, readily removable and interchangeable.



SECTIONAL CONVEYOR  
(Intervyor)

## VERTICAL ELEVATORS

In both electric and hand power types. Make every inch of warehouse space available without additional labor or time. Hinged to clear doorways and other obstructions. Made in various sizes and capacities to elevate up to 2000 lbs. per load. Fast, reliable and safe. Portable.



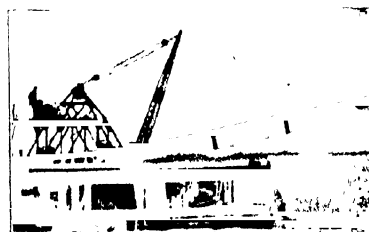
VERTICAL ELEVATOR



PORTABLE BELT CONVEYOR

## PORTABLE BELT CONVEYORS

Continuously moving belt carries bulk materials as rapidly as they can be placed on belt. Unusually low receiving end allows placing under hopper of drop-bottom cars. Unloads cars, loads trucks and wagons, and piles with 25% the labor and time of the hand-and-shovel method. Readily portable.



BARGE UNLOADER

## CAR, TRUCK AND BOAT LOADERS AND UNLOADERS

Designed and built in every case to meet the individual conditions. Varying water levels, different types of boats and miscellaneous commodities hold no terror for "Brown-Portable" engineers.

## FACILITIES

Eighteen years of specialized experience in the design and manufacture of portable handling machinery, coupled with the prestige of being the originators of and the leading specialists in portable and sectional handling appliances, are the strongest guarantees that can be offered on behalf of the perfect operation and long life of "Brown-Portable" products. Bulletin No. 167-A gives interesting facts on the important subject of "Cutting Handling Costs." It is sent to any address without cost or obligation.



CAR LOADER

VYNUL HARBAGE  
President

FRANK J. MURRAY  
1st Vice-President

P. R. PERKINS  
Secretary

G. A. HANKINS  
Treasurer

# THE BUCKEYE DRYER COMPANY, Inc.

Engineers and Manufacturers of Dryers for Industrial Use

243 North High Street  
COLUMBUS, OHIO, U. S. A.

NEW YORK, N. Y.  
B. P. Goldman, M. E., 220 W. 42d Street

## REPRESENTATIVES

DENVER, COLO.  
The Dry Milling Engineering Co., Boston Building

## PRODUCTS

Dryers - Six Types - A Dryer for Every Purpose.

## ADVANTAGES OF BUCKEYE DRYERS

Capacity, Fuel Economy, Thoroughness in Construction, Economy in Operation and Maintenance

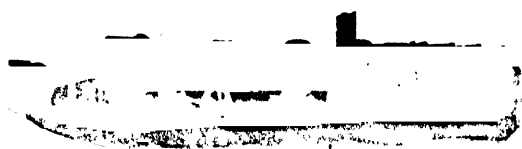
Tires, Rollers, Gears and all Wearing Parts made of steel



TYPE A

A Dryer suitable for drying Packing House Tankage, Sewage Sludge Cake, Garbage, etc. Preferably materials carrying moisture between 40% and 90%.

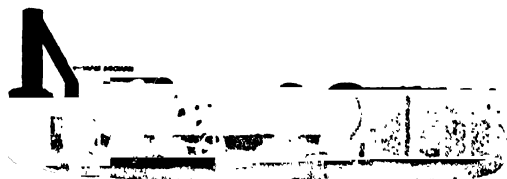
Extensively used by Packing Houses for drying Tankage, Blood, Steamed Bone, etc., and by Cities for drying Sewage Sludge, Garbage, etc.



TYPE B

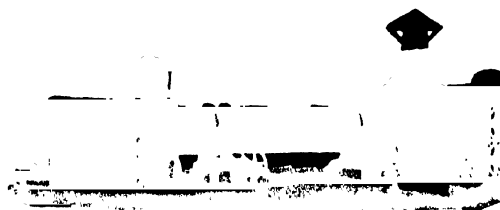
A Dryer suitable for drying Pressed Tankage, Blood, Stock Feed, Canning House Waste, Coal, Concentrates, Salt, Peat, etc. Preferably materials carrying moisture between 10% and 60%.

Extensively used for drying Coal for Powdered Coal Plants, Cannery Wastes, Salt, Paint Materials, Pressed Tankage, etc.



TYPE C

A Dryer specially adapted to drying High Grade Butter and Cheese Salt, Sensitive Materials which cannot be subjected to direct contact with the products of combustion from the furnace, or where it is desired to make use of waste heat from power plant

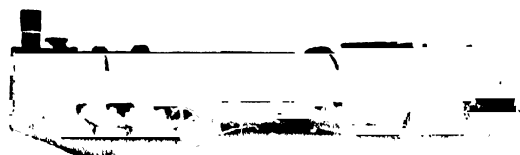


TYPE D

A Dryer specially adapted to drying of Stock Feeds from Starch Houses, Brewers' Grains, Beet Sugar Factories, etc.

Extensively used for drying Beet Pulp and Potatoes.

Exceptional Capacity.

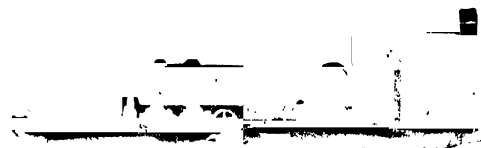


TYPE E

A Dryer where the drying agent is air heated by a bank of steam coils before being blown through the dryer.

Suitable for drying Chemicals, Borax, Baking Powder, etc., requiring a low temperature.

Exhaust steam can be made use of for heating the coils of this type of dryer when desired.



TYPE G

A Plain Shell Dryer suitable for drying any material not susceptible to injury by overheating, such as Rock, Sand, Gravel, Ores, etc.

## SOME USERS OF BUCKEYE DRYERS

Morris & Co., Wilson & Co., Goodyear Tire and Rubber Co., Morton Salt Co., Carey Salt Co., Mulkey Salt Co., Pennsylvania Salt Mfg. Co., Colonial Salt Co., Milwaukee, Wis., and Houston, Tex., Sewage Plants, Miller Rubber Co., Marine Products Corp., Gilligan, Chipley Co.

During the year 1920, 60% of our business consisted of repeat orders from large concerns, who, after trying out many machines, adopted Buckeye Dryers.

# BROWN PORTABLE CONVEYING MACHINERY CO.

10 SOUTH LA SALLE ST., CHICAGO, ILLINOIS, U. S. A.

Sales Representatives in All Parts of the World

## PRODUCTS

Elevators, Conveyors, Loaders, Unloaders for the Economic Handling of Packed and Loose Materials.

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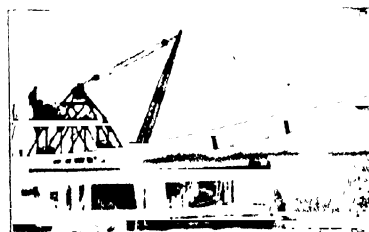
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CAR LOADER

# BUFFALO FOUNDRY & MACHINE COMPANY

Vacuum Dryers, Evaporators, Chemical and Sugar Apparatus

NEW YORK OFFICE  
17 BATTERY PLACE

1575 FILLMORE AVENUE, BUFFALO, N. Y.

Cable Address  
"BUFOUNDRY"

## PRODUCTS

### "Buflovak" Vacuum Drying Apparatus

Vacuum Drum Dryers  
Vacuum Shelf Dryers  
Vacuum Rotary Dryers  
Impregnating Apparatus  
Dry Vacuum Pumps  
Surface Condensers  
Barometric Condensers  
Expansion Tanks  
Solvent Recovery Apparatus

### "Buflovak" Evaporators

Horizontal Tube Evaporators  
Vertical Tube Evaporators  
Rapid Circulation Evaporators  
All Cast-Iron Evaporators  
Crystallizing Evaporators  
High Concentrators  
Causticizing Apparatus  
Caustic Recovery Apparatus  
By-Product Recovery Apparatus  
Receivers, Salt Filters, Pre-heaters, etc.

Special Evaporating Equipment in steel, copper, bronze, aluminum, all cast iron, and other special metals.

### "Buflokast" Chemical Apparatus

Nitrators	Fusion Kettles
Reducers	Beta-Naphthol Stills
Reflux Condensers	Phenol Stills
Sulphonators	Vacuum Ovens
Vacuum Stills	Nitric Retorts
Drum Dryers	Denitrators
Autoclaves	Acid Eggs
Caustic Pots	Crystallizers
Caustic Flakers	Jacketed Kettles
Nitric Acid Plants	
Concentrating Apparatus for Nitric, Sulphuric and Hydrochloric Acids	
Recovery Systems for Nitric and Sulphuric Acids	
Acid-Resistant Castings	
Special Chemical Castings	

### "Buflovak" Sugar Apparatus

Diffusion Batteries	Catchalls
Pulp Catchers	Condensers
Vacuum Pans	Coolers
Vacuum Dryers	Bag Filters
Vacuum Pumps	Filter Presses
Steam Separators	Granulators
Sand Filters	Crystallizers
Bone Black Filters	Kilns
Bone Black Dryers	Retorts
Heaters	Mixers
Evaporators	Juice Heaters

## RESEARCH LABORATORIES

By means of these laboratories, opportunities are afforded for making practical tests in each type of dryer and evaporator, and in various types of chemical and other apparatus. This experimental work is conducted without charge or obligation, except for furnishing the necessary materials and paying transportation expenses.

## Engineering and Consultation

Our organization includes a corps of mechanical, metallurgical, chemical, vacuum, and sugar engineers, whose services for advice and consultation are placed at your disposal.

Some of the fields covered are:

Drying and Evaporating  
Heavy chemicals, acids, and high explosives  
Organic chemicals, dyestuffs, coal-tar intermediates, etc  
Caustic soda, potash and other alkalis  
Sugar apparatus  
Special castings for chemical, heat resisting and other purposes

## VACUUM DRUM DRYER

The "Buflovak" Vacuum Drum Dryer is used for converting liquids into dry form. Owing to the high vacuum and the consequent low temperatures employed, the most delicate materials may be dried with the utmost safety as all danger of overheating or other injury is avoided. The operation is practically continuous and automatic. The apparatus consists of a hollow heated drum revolving in a sealed casing provided with devices for applying the liquid to and removing the dry material from the drum. Steam, hot water or other heating medium is supplied to the interior of the drum. A high vacuum is maintained in the casing by means of a high efficiency dry vacuum pump and consequently the material is dried at an extremely low temperature.



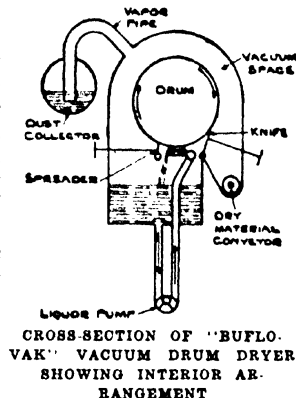
"BUFLOVAK" VACUUM DRUM DRYER

Used for drying solutions such as Dyewood, Tannin, Pharmaceutical and other Extracts; Glues, White Lead, Milk, Eggs, Serum, Liquid Foods, Coffee, Chemical Solutions, and other liquids containing solids.

*Continued on Next Page*

**VACUUM DRYING APPARATUS: Continued**  
**VACUUM DRUM DRYER: Continued**

The liquid is applied to the drum by our patented automatic device which produces a uniform coating on the drum and consequently a uniform dry product. Foaming, viscosity or other characteristics of the liquid do not affect the uniformity of the dry product, because the drum is entirely clear of the body of liquid as shown in the drawing.



While the vacuum drum dryer has in theory been considered the ideal apparatus for drying liquids, satisfactory commercial results were not obtained until our patented devices for applying the liquid to the drum were perfected. Where the drum dips into the main body of the liquid it is impossible to maintain a constant level on many materials, due to the agitation and foaming of the liquid. This change in level makes a corresponding change in the amount of drum surface dipping in the liquid, which varies the moisture content of the finished product, interrupts the continuous operation of the dryer, reduces the output, and increases the cost of operation.

Where the dry material can be mechanically conveyed, two receivers are provided, which enable the dryer to be operated continuously, a conveyor being employed to deliver the material to one receiver while the other receiver is being emptied. Where the nature of the material requires batch operation, a single receiver of large capacity is used.

All sizes are so constructed that they may be cleaned and kept in sanitary condition. A man can enter the casing of the larger sizes and scour all parts of the interior. The smallest dryer is so constructed that the casing over the drum can be readily moved back and free access had to all parts.



**"BUFLOVAK" VACUUM DRUM DRYER—NO. 1 SIZE**

Designed for drying smaller quantities of liquid materials than can be handled economically in our larger apparatus. Also makes a valuable laboratory drum dryer.

**ATMOSPHERIC DRUM DRYER**

For drying liquids that do not require a vacuum, our atmospheric type, which embodies the patented principles and devices of the vacuum type, is recommended. Only a small part of the drum surface comes in contact with the wet material, which means greater drying area and low cost of drying.



**ATMOSPHERIC DRUM DRYER**

**VACUUM SHELF DRYER**



**"BUFLOVAK" VACUUM SHELF DRYER**

The "Buflovak" Vacuum Shelf Dryer is adapted to the drying of materials that are best handled in pans or trays. The dryer consists of a rectangular chamber containing hollow shelves, steam or hot water heated, on which are placed

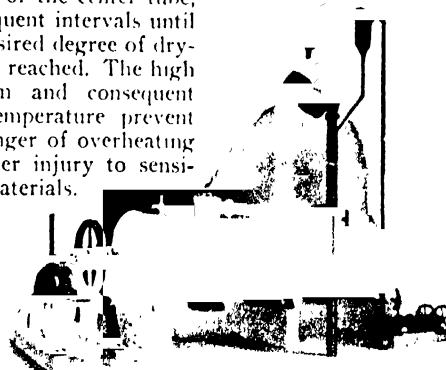
the pans or trays containing the material to be dried. If desired, the volatile matter or solvents removed from the material may be reclaimed. This type of dryer is used very extensively in many industries and is adapted to the drying of a great variety of materials.

A distinctive feature of the "Buflovak" Vacuum Shelf Dryer is the construction of the chamber casting which in all sizes is made in one piece. This eliminates many joints which would otherwise be necessary. This feature, combined with the special quality of metal used, insures a high vacuum and consequently extremely low temperature in the apparatus, so that all materials may be dried without any danger of overheating, oxidation or other injury.

These dryers are built in many sizes and it is possible to accommodate any required capacity.

**VACUUM ROTARY DRYER**

This apparatus is used for drying materials that permit agitation or mixing. The material is kept in constant motion by means of revolving arms, attached to the center heating tube, so that the material comes in contact with the heating surfaces, either the steam jacket or the center tube, at frequent intervals until the desired degree of dryness is reached. The high vacuum and consequent low temperature prevent all danger of overheating or other injury to sensitive materials.



**"BUFLOVAK" VACUUM ROTARY DRYER**

**IMPREGNATING APPARATUS**

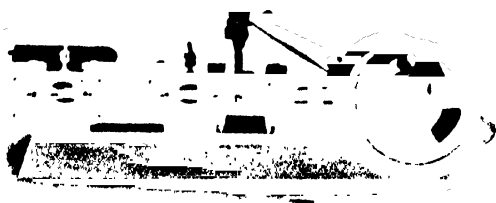
For drying various materials and impregnating them with insulating, waterproofing, fireproofing, coloring and other compounds. Used for insulating electric coils, cables, transformers, etc.; impregnating wood with stain or color for producing imitations of other woods.



**IMPREGNATING APPARATUS**

*Continued on Next Page*

### VACUUM DRYING APPARATUS: Continued DRY VACUUM PUMP



"BUFLOVAK" DRY VACUUM PUMP

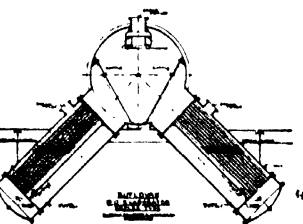
The success of "Buflovak" Vacuum Apparatus is partly due to the efficiency of "Buflovak" dry vacuum pumps which are designed for the most exacting service. After their experience with other makes, our customers invariably express astonishment at the high vacuum produced and maintained with these pumps. Built in many sizes single- or two-stage—steam, belt or motor driven.

### "BUFLOVAK" EVAPORATORS

**Rapid Circulation Evaporators**—Especially adapted for concentrating and distilling solutions which should not be exposed to heat except for the shortest possible time; also for solutions that have a tendency to foam or produce scale. The amount of liquor in circulation is very small and the possibility of foaming is reduced to a minimum as the liquor level is always kept low and the foam is broken up in the upper part of the tubes where film evaporation takes place.

This evaporator can be operated with very small temperature differences, on which account it can be used in multiple effects of many units, which makes for high economy in steam consumption and large quantity of liquor handled.

A special advantage of the inclined type is the accessibility of the tubes and the interior of the vapor body. By simply opening a door in the bottom of the evaporator the tubes are easily reached from the outside for cleaning. However, the high speed of the liquor (100 feet or more per second) has a scouring effect upon the tubes and helps to keep them clean. The interior of the vapor body is easily reached through a manhole in the side. Where a large heating surface is required each effect can be constructed with two steam chests attached to the vapor body as shown in the drawing of the duplex type, which also shows the general arrangement of the vapor body, steam chest and tubes.



"BUFLOVAK" DUPLEX TYPE  
RAPID CIRCULATION  
EVAPORATOR

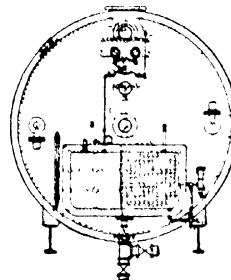
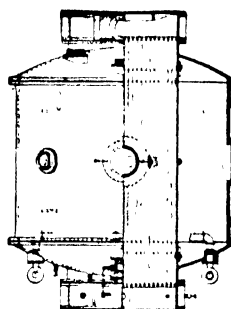
### EVAPORATORS: Continued RAPID CIRCULATION EVAPORATOR, Vertical Type



"BUFLOVAK" VERTICAL TYPE RAPID CIRCULATION EVAPORATOR

The construction of this type has been developed from the standard vertical tube evaporator, the length of tubes being increased and the liquor space being reduced. The rapid circulation of the liquid prevents overheating so that the most delicate liquors can be handled with the utmost safety. The special baffle and tube arrangement eliminates losses caused by foaming and entrainment. The solution circulates at such a velocity that it tends to scour the tubes, thereby reducing the amount of cleaning on some materials and eliminating it almost entirely on others. When mechanical cleaning becomes necessary the tubes are easily reached by removing a cover plate at the top of the evaporator, which permits cleaning from the outside of the equipment without removing the tubes. This evaporator occupies very little floor space and the erection and operation are extremely simple.

### HORIZONTAL TUBE EVAPORATOR



PLAN AND ELEVATION

This evaporator is used for common solutions which are distilled or concentrated to higher densities without the separation of salts and which have no tendency to foam or produce scale. The evaporator body consists of a horizontal cylindrical shell closed at both ends with spherical heads. Ample resistance to inside or outside pressures is thus assured without the necessity of excessive wall thicknesses as in the case of the rectangular shell constructed of flat plates.

The large downtake on each side of the tube nest allows a rapid and uniform circulation through all parts of the heating surfaces. Losses by entrainment have been overcome by making the width of the evaporator body (above the liquor level) about twice the width of the tube nest, which reduces the vapor speed. The shells are made in one piece up to 12 feet long, consequently the number of joints and the chances of leakage are less than in any other type.

An important feature of this construction is the possibility of enlarging the evaporator by simply adding another cylindrical shell and providing longer tubes, thus avoiding the necessity of installing entirely new equipment when greater capacity is needed.

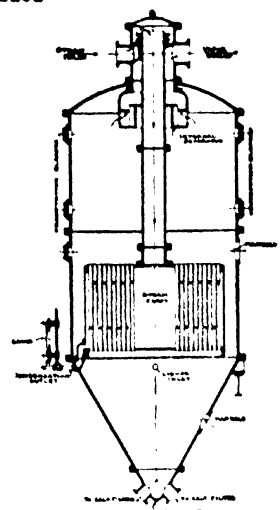
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# EVAPORATORS: Continued VERTICAL TUBE EVAPORATOR

This evaporator is of the crystallizing type and is used with salt filters for evaporating and crystallizing solutions containing salts which become insoluble during concentration.

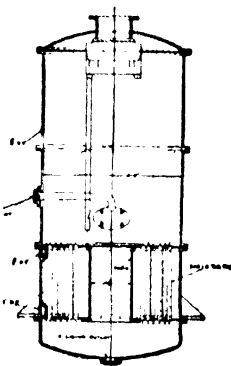
The steam chest is of the floating type, forming a separate unit instead of being an integral part of the evaporator body. The floating type steam chest with the annular down-take, affords a rapid recirculation of the solution which is a necessary aid in depositing the salt in the filters.



VERTICAL TUBE EVAPORATOR

# VERTICAL TUBE FINISHING PAN FOR MALT EXTRACTS AND OTHER SYRUPS

This evaporator is designed for heavy concentration of malt extracts and similar syrups to 80° Balling. The construction of the pan is such that the actual contents is small and the liquor is not in contact with the heating surface longer than is absolutely necessary. The tubes are kept clean and sanitary by the rapid circulation of the liquor, which eliminates overheating and prevents coating of the tubes.



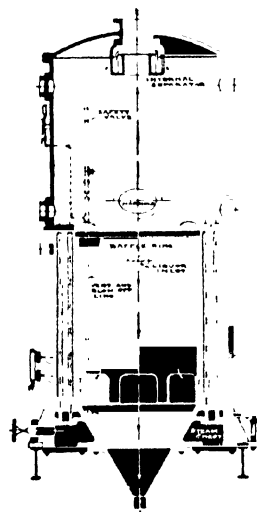
INTERIOR ELEVATION  
VERTICAL  
TUBE FINISHING  
PAN

# HIGH CONCENTRATORS

Especially adapted to the high concentration of caustic soda, potash, ammonium nitrate and electrolytic caustic solutions above 36° Bé. This evaporator produces a very rapid circulation of the liquor, and is designed for concentrating liquors to higher densities than are practicable in other types.

The tubes are made of alkali-resisting or acid-resisting iron, copper, or special bronze, depending on the nature of the liquor to be concentrated.

Furnished in single or multiple effects, with or without salt separation.



"BUFLOVAK" HIGH  
CONCENTRATOR

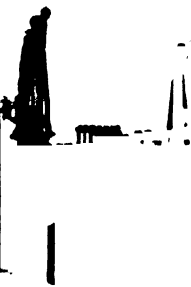
# "BUFLOKAST" CHEMICAL APPARATUS

This line includes apparatus for producing heavy chemicals, acids, caustic soda and other alkalis, organic chemicals, high explosives, coal tar intermediates, etc. Apparatus furnished for all standard chemical operations, such as nitration, denitration, reduction, sulphonation, chlorination, distillation, crystallization, caustic fusion, etc. Complete plants furnished for manufacturing many chemical products.

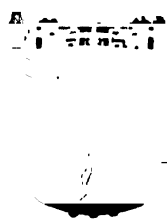
# "BUFLOKAST" NITRATOR, HOUGH TYPE

This nitrator was designed to obtain a high yield and large output with a high degree of safety in operation. These features have been made possible by providing for control of the temperature at the point of reaction, and the rapid incorporation with the acids of the reacting chemical compounds. A notable feature is the rapid circulation of the acid which prevents any appreciable rise in temperature at the point of contact of the hydrocarbon and the acid. The safety devices employed make it possible to conduct nitrations much faster and secure a far greater output than with any other type ever used.

This apparatus can be used with equal efficiency and safety for nitrating, reducing, sulphonating, chlorinating and other chemical operations. Also adaptable for mixing, blending and washing oils. Special type for nitrating glycerine.

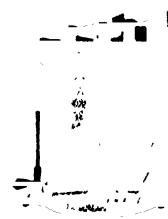


"BUFLOKAST"  
NITRATOR



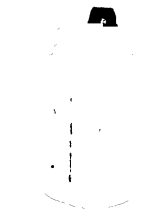
NITRATOR

Provided with cooling jacket, tubes, or both. Temperature of each tube individually controlled.



REDUCER

Noted for large output, and for ease and cleanliness of operation. Furnished with or without jacket.



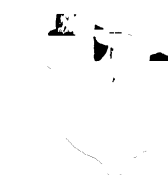
SULPHONATOR

Construction especially heavy and durable. Designed for effective agitation.



CAUSTIC POT

Caustic pots and fusion kettles are constructed of special metal noted for its success in withstanding combined action of caustic and high temperature.



FUSION KETTLE



ACID EGG

Vertical and horizontal types. Sizes, 25 to 1000 gals capacity.

Continued on Next Page

### CHEMICAL APPARATUS: PHENOL (Carbolic Acid)

#### STILL

Noted for simplicity in design and durability in service. Equipped with special device for deodorizing the vapors that pass from the still to the condenser. Condenser is arranged for water supply at the bottom and overflow at the top, and fitted with a special coil to prevent discoloration of the acid.

Built in various sizes up to 1,000 gallons capacity.

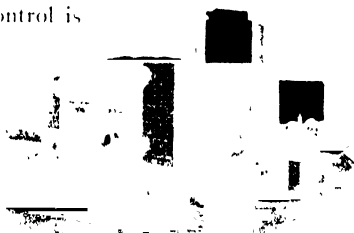


"BUFLOKAST"  
PHENOL STILL

### DIRECT HEAT SHELF RETORT

Operated with or without vacuum. Especially adapted for reclaiming high boiling point solvents where solid materials must be heated and temperature control is of great importance.

Also used in the manufacture of sulfamic and naphthionic acids and is far more efficient than the type previously used for this purpose.



"BUFLOVAK" DIRECT HEAT  
SHELF RETORT

### NITRIC RETORTS

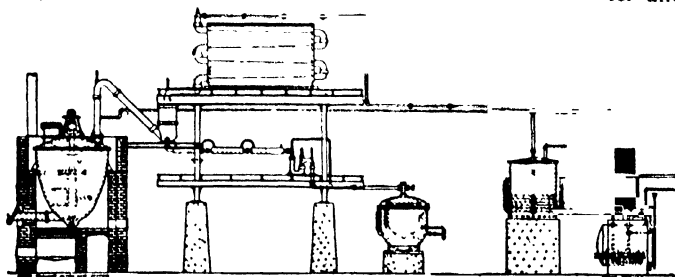
"Buflokast" nitric retorts have long since become a standard unit with most of the high explosive companies and other manufacturers of nitric acid. Especially noted for durability. Designed of such proportions as to give maximum yield per charge with low cost for furnace setting and operation.



"BUFLOKAST" NITRIC  
ACID RETORT

### VACUUM NITRIC ACID PLANT, HOUGH TYPE

Furnished complete with vacuum still, condensing system, pump, bleacher, hydrometer pot, acid receivers, tanks and scrubber. Designed for producing nitric acid of great strength and purity at low cost of production and upkeep. The vacuum operation insures distillation at low temperature and increases the safety and ease of operation.



"BUFLOVAK" VACUUM NITRIC ACID PLANT

### NITRIC AND SULPHURIC ACID RECOVERY AND CONCENTRATING APPARATUS

Complete equipment furnished for recovering nitric and sulphuric acids at a high degree of concentration from mixed nitrating acids. A special feature of this apparatus is its compactness, thereby requiring small space as compared with other systems, and a lower capital investment. Other distinguishing features are high operating efficiency and low upkeep cost.

### CRYSTALLIZERS

Furnished in the vacuum and atmospheric types. Adapted for concentrating and crystallizing many products, including ammonium nitrate and TNT. The vacuum type is especially adapted for delicate materials requiring low temperatures.



VACUUM  
CRYSTALLIZER  
When furnished in the  
atmospheric type, the dome  
is omitted

### SPECIAL CHEMICAL CASTINGS

"Buflokast" service also includes the manufacture of special castings for chemical, heat resisting and other requirements. The materials for these castings are carefully analyzed and metal compositions produced with laboratory exactness. The result is a finished casting of known quality with physical and chemical properties suited to the conditions it is to meet.

### JACKETED KETTLE

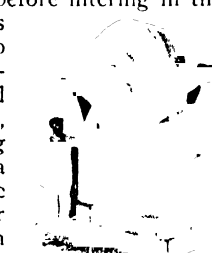
### "BUFLOVAK" SUGAR APPARATUS

Our Sugar Machinery Department is under the supervision of engineers who have had many years' experience in designing, constructing and operating sugar machinery, including complete manufacturing plants, in the production of brown, white and refined sugars in the cane and beet sugar fields. This experience, coupled with a broad manufacturing experience in building similar and more complex apparatus, is assurance of receiving sugar machinery based on the soundest principles of engineering and manufacturing practice.

Only a few types of sugar apparatus are shown. Full information pertaining to any of the items listed on the fourth page preceding will be furnished on request.

### "BUFLOVAK" ROTARY FILTER

Used for decolorizing and removing suspended matter and impurities from syrup before filtering in the vertical filter. Operates continuously, the syrup passing through the filter cloth by gravity, and the remaining syrup, scum and residue being removed in order by a vacuum suction nozzle on one side and another at the top, and a steam jet on the opposite side.



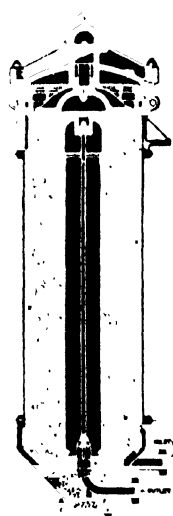
"BUFLOVAK" ROTARY  
FILTER

*Continued on Next Page*

# **SUGAR APPARATUS: Continued** **"BUFLOVAK" VERTICAL FILTER**

Used for filtering with bone black and other filtering mediums. The filtering medium is inserted between two concentric screens contained in the filter. The inner screen and the top of the filtering medium is covered with filter cloth. The filtration takes place through the outer screen, through the filtering medium, into the inner screen and out.

Provision is made against floating of the material and the formation of short circuiting channels. When the filtration is completed the filter is drained, and the impurities are removed by blowing steam through the filtering medium in the opposite direction, this cycle being repeated until necessary to renew the filtering materials.



**VERTICAL FILTER**

## **BAG FILTER**

Constructed in rectangular and cylindrical types, and arranged to permit removal and replacement of heads and bags with the least amount of interruption to operation. Provision is also made so as to prevent a falling bag from closing entirely the discharge opening.

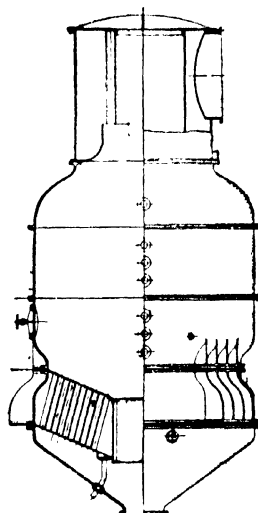


**REMOVABLE HEAD FOR  
RECTANGULAR BAG  
FILTER**

## **"BUFLOVAK" CALANDRIA VACUUM PANS**

These are built in several types including the Engel calandria, flat calandria, and coil types. The Engel type calandria pan is designed for evaporating at low temperature and low steam pressure, liquids of various densities, including highly concentrated juices. The heating element is placed at a low point in the pan in order to control the size of the crystal, and finish the crystallization in the same apparatus, instead of distributing the nucleus into several pans to obtain the required size of the crystals. For supersaturated and highly concentrated liquids a propeller is provided at the bottom of the pan.

Special calandria and coil type pans are built to order.



**CALANDRIA VACUUM PAN  
Engel Type**

## **ROTARY DRYER, ENGEL TYPE**

Designed for drying sugar and a variety of other materials that do not require a vacuum. A special feature of this dryer is our patented disseminating screen which is concentric with the drum. The material falling on this screen, as the shell revolves, be-



**ROTARY DRYER, ENGEL TYPE**

comes disseminated and allows for the free action of the drying air. The screen also breaks the fall of crystals, thereby reducing the breakage of crystals into small particles and the consequent formation of dust.

## **"BUFLOVAK" JUICE HEATER**

This heater is of the floating head type, allowing for expansion and contraction in the tubes, and eliminating stuffing boxes. One end of the heater is provided with a rigid head and the opposite end with a number of sliding heads to which are connected the nests of tubes. The juice enters at the bottom of the rigid head and after passing through the heater by means of the tubes, passes out at the top of the rigid head.

The efficiency of this heater lies in the high velocity of the juices through the tubes, low cost of maintenance, and the fact that it is easily cleaned.



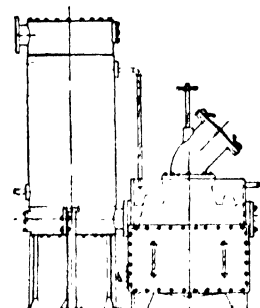
**"BUFLOVAK" JUICE HEATER**

## **"BUFLOVAK" SULPHUR FURNACE AND COOLER**

This sulphur furnace is of the continuous type and can be charged without interfering with the operation of the stove.

The sulphur drops from a special hopper to the combustion tray provided with slotted openings, which serve to spread the air evenly over the whole surface, thus obtaining a uniform combustion. The condensed sulphur is removed without any trouble by means of hand-holes in the cooler.

These furnaces and coolers are furnished either single or in batteries to take care of any capacity desired.



**"BUFLOVAK" SULPHUR FURNACE AND COOLER**

## **SPECIAL SUGAR APPARATUS**

We are prepared to build apparatus according to our standard or special designs, or in accordance with plans and specifications submitted by customers.

# BUFFALO METER CO.

ESTABLISHED 1892

2887 Main Street, BUFFALO, N. Y.

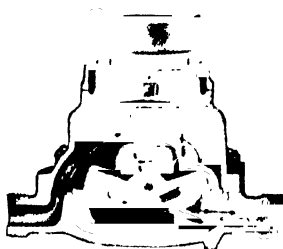
## PRODUCTS

Niagara and American Water Meters  
Niagara Oil Meters for Oils and Gasoline  
Niagara Hot Water Meters

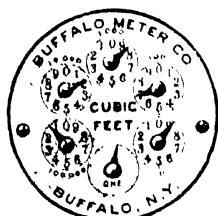
## NIAGARA AND AMERICAN WATER METERS

Over 400,000 sold

Niagara and American Meters are of the disc type. The Niagara Meter has a galvanized cast iron outside casing; the American Meter has a bronze main casing with either a bronze base or a galvanized cast iron base. The works in the three different casings are the same and interchangeable. Upon opening the meter at the bolted flange, each intermediate gear may be immediately removed from its bearing, the measuring chamber lifted from its seat, the strainer slipped out, or the register tried by turning the stuffing box gear. All submerged working bearings are protected against sand and sediment. The hard rubber measuring disc is reinforced with a metal plate. Purchaser has option of round reading or straight reading register indicating cubic feet, U. S. gals., imp. gals., or litres.



NIAGARA AND AMERICAN WATER METER PATENTED



ROUND READING REGISTER



STRAIGHT READING REGISTER

## GROSS PRICE LIST WATER METERS, JAN. 1, 1920

Size of meter inches	Greatest proper capacity U.S. gals. per minute	Niagara meter only galv. iron outside case	American meter only bronze main case and galv. iron base	American meter only all bronze outside case	Brass couplings per pair extra	Approx. weight meter and couplings boxed lbs.
$\frac{3}{4} \times \frac{1}{2}$	20	\$16.00	\$18.00	\$20.00	\$1.00†	14
$\frac{3}{4} \times \frac{3}{4}$	20	16.00	18.00	20.00	1.50†	14
$\frac{3}{4} \times 1$	34	24.00	27.00	30.00	1.50†	20
1	54	35.20	39.60	44.00	2.20†	30
$1\frac{1}{4}$	75	48.00	54.00	60.00	3.00	40
1	100	64.00	72.00	80.00*	4.00	60
$1\frac{1}{2}$	160	96.00	108.00	120.00*	6.00	100
2	240	140.00	157.50	175.00	8.75	150
$2\frac{1}{2}$	315	192.00	216.00	240.00	Flanges no charge	200

\*  $1\frac{1}{2}$ " and 2" All-bronze case meters may be furnished with internal standard pipe threads when specially ordered.

† In these sizes quarter bent couplings may be furnished at the following prices per pair:  $\frac{1}{2}$ ", \$1.50,  $\frac{3}{4}$ ", \$2.00, 1", \$3.00.

## NIAGARA OIL METER

For Oil and Gasoline.

Niagara Oil Meters are used to measure and compare the quantity of oil and gasoline delivered in tank cars or otherwise with the amount invoiced; they are used to show the consumption and regulate the flow of oil to burners under boilers, furnaces and ovens; they measure gasoline pumped or forced from gasoline storage and retailing systems. They will operate on pres-



NIAGARA OIL METER PATENTED

sures of a pound per square inch or higher, and on oil of any temperature, and thus are adapted for use under almost all conditions. The size of meter to use is determined by the rate of flow to be measured. For meters with large vertical dial add \$20.00 to list.

## GROSS PRICE LIST OIL METERS, JAN. 1, 1920

Size of meter	Capacity for continuous rate of flow per hour, U.S. gals.	Size inches, and kind of pipe connections	List prices
A	6 to 300	$\frac{1}{2}$ Unions	\$20.00
B	10 to 500	$\frac{3}{4}$ or 1 Unions	20.00
C	30 to 1000	$\frac{3}{4}$ or 1 Unions	40.00
DV	60 to 3000	1 or $1\frac{1}{2}$ Unions	44.00
EV	90 to 3000	$1\frac{1}{4}$ or $1\frac{1}{2}$ Unions	60.00
FV	120 to 1000	$1\frac{1}{2}$ Unions	80.00
F	175 to 6000	$1\frac{1}{2}$ or 2 Unions	120.00
G	250 to 9000	2 or $2\frac{1}{2}$ Unions	160.00
G	250 to 9000	3 Flanges	200.00

## NIAGARA HOT WATER METER

The Niagara Hot Water Meter is similar in design to the Niagara Cold Water Meter but has works of special construction to run in water of any temperature up to 250° Fahrenheit. The register is of the all-metal straight reading type and indicates U. S. gallons, imperial gallons or litres. For meters with large vertical dial add \$20.00 to list.

## GROSS PRICE LIST HOT WATER METERS, JAN. 1, 1920

Size of meter	Capacity According to h.p. of boiler	Size inches and kind of pipe connections	List prices
B	8 to 20 H.P.	$\frac{1}{2}$ or $\frac{3}{4}$ Unions	\$20.00
C	10 to 40 "	$\frac{3}{4}$ or 1 Unions	30.00
D	25 to 90 "	1 or $1\frac{1}{4}$ Unions	44.00
EV	40 to 150 "	$1\frac{1}{4}$ or $1\frac{1}{2}$ Unions	60.00
E	50 to 200 "	$1\frac{1}{4}$ or $1\frac{1}{2}$ Unions	80.00
F	80 to 325 "	$1\frac{1}{2}$ or 2 Unions	120.00
G	150 to 600 "	$1\frac{1}{2}$ or 2 Unions	160.00
G	150 to 600 "	2 or $2\frac{1}{2}$ Unions	200.00
Battery 2 3"G	300 to 1200 "	3 Flanges	450.00

† The size of meter required is not determined by the size of pipe on which it is to be set, but by the flow to be measured. To facilitate setting on different sizes of pipes each meter may be furnished with either of the two sizes of connections and openings listed.

# H. W. CALDWELL & SON COMPANY

LINK-BELT COMPANY, OWNER

Elevating, Conveying and Power Transmitting Machinery

Main Office and Works

17TH STREET AND WESTERN AVENUE, CHICAGO, ILL.

EASTERN SALES AND ENGINEERING OFFICE: New York, 59 Church St.  
SOUTHERN SALES OFFICE: 709 Main Street, Dallas, Texas

## PRODUCTS AND SERVICES:

Elevating, Conveying and Power Transmitting Machinery—including Bearings, Helicoid Screw Conveyors, Apron, Belt, Drag and Pan Conveyors, Malleable and Steel Chain, Bucket Elevators, Gears, Pulleys, Friction clutches, Ice Handling Machinery, Rope drives and Sheaves, Sprocket wheels, Screens.

Special Machinery constructed according to customer's design.

Engineers, Founders and Machinists.

## ELEVATING MACHINERY:

Elevators of all kinds for handling fine and coarse material used in chemical manufacturing and allied industrial plants. Elevators—with buckets on belt or chain. Box, barrel and package elevator. Elevators for coal, coke, sand and stone. Elevator casings of steel or cast iron. Elevator buckets of steel, malleable iron, copper, aluminum. Elevator boots of steel or cast iron.

## POWER TRANSMITTING MACHINERY:

Babbitted bearings of all types, plain oiling, self-oiling, rigid, ball and socket. Shafting collars, pulleys, friction clutches, friction clutch pulleys and cut-off couplings. Flywheels up to twenty feet diameter, complete rope drives, sprockets with chilled rims.



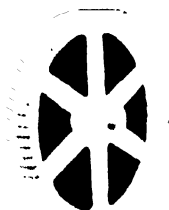
PAN CONVEYER



"HELICOID" CONVEYOR

## CONVEYORS:

Sole manufacturers of "Helicoid" Screw Conveyor, the only conveyor having flight made of one continuous strip of metal. No rivets or laps; mounted on pipe or solid shaft. Sizes 3 to 16 inches. Made of steel, copper, aluminum, brass and cast iron. We also make belt conveyors, apron conveyors, drag conveyors, pan conveyors of steel and cast iron. Troughs for screw conveyors made of steel, copper or cast iron.



MACHINE MOLDED GEAR

## GEARS:

This company has the most complete line of preparations and patterns in the United States for making machine and pattern molded gears. Made of cast iron, semi-steel, cast steel, brass or bronze. We also furnish gears with machine cut teeth. Also mortise wheels and worm drives.



MALLEABLE AND STEEL CHAIN

## CHAINS:

Standard malleable link chain belting, combination malleable and steel chain, malleable roller chain, steel chain with or without rollers and bushings.

## CATALOG:

Catalog No. 45 contains over 800 pages of illustrations, lists and information of value. A copy will be gladly sent prepaid upon request.

STEEL ELEVATOR CASING

BEARINGS

STEEL BUCKETS



HEAVY BELT CONVEYOR CARRIERS



STEEL PAN CONVEYOR



SCREEN WITH STEEL HOUSING

# W. E. CALDWELL COMPANY

INCORPORATED

Manufacturers of Wood and Steel Tanks, Towers, Agitators and  
Power Transmission Machinery

2232 BROOK STREET, LOUISVILLE, KY.

**PRODUCTS:** Wood and Steel Tanks, Round, Rectangular or any shape or size with or without lead or other lining, for water, acids or any liquid; Tank Agitators and complete mixing or processing tanks; Tank Towers of Steel and Wood; Friction Clutches, Pulleys, Gearing and General Power Transmission Machinery.

THE TANK WITH  
A REPUTATION  
*Caldwell*  
TANKS  
AND  
AGITATORS

## INDUSTRIAL TANKS:

We have always made a specialty of industrial tanks (chemical, paper mill, dyeing, etc.) and our plant is peculiarly adapted for manufacturing agitators and tanks with mechanical attachments as we have our own foundry, machine, structural and plate steel shops in addition to our wood tank shop.

## TANK WOODS:

We build tanks of cypress, fir, yellow pine, white pine, white cedar and yellow poplar and from thirty years' experience we have deduced the following facts:

Cypress is without question the best tank wood for water and most acids in-

cluding sulphuric, muriatic, and acetic. It resists the charring action of sulphuric acid better than any other wood and can be used with hot or cold solutions up to about 20° Be. Stronger solutions require a lead lining. It is also used for brine, tar, tar oil, fuel oil and a number of other liquids.

Fir is second to cypress in its general qualities and for use with water but it has not been used to any great extent for holding chemicals though it has so far shown many of the qualities of cypress.

Yellow pine is best suited for nitric acid as it resists oxidation better than any other tank wood. It will also hold satisfactorily weak solutions of other acids.

White pine is probably best suited for brine tanks and as a cheaper substitute for cypress.

White cedar is a cheaper tank wood and is used mostly for water.

Yellow poplar is the closest grained tank wood and is used to hold the alcohols and other penetrating liquids.

## ROUND WOOD TANKS:

We regularly furnish round wood tanks in accordance with the following specifications, but we can make them to meet any special requirements.

### SPECIFICATIONS:

**Lumber**—Thoroughly dry, without loose or unsound knots, splits, shake, peck, worm holes or other defects. All heart throughout when so specified, or otherwise all heart on inside, no sap except sound sap on outside only and then not to exceed one-half the thickness.

**Thickness for Water**—2 inches for 10,000 gallons and smaller, 2½ inches up to 20,000 gallons, 3 inches for larger sizes, and 4, 6, 8 or 10 inches for special purposes. The finished thicknesses are 1¾, 2¼, 2¾, 3½, 5½ and 7½ inches respectively.

### Standard Inside Diameters

Diam.		Gals. 1 ft. deep	Diam.		Gals. 1 ft. deep	Diam.		Gals. 1 ft. deep
ft.	ins.		ft.	ins.		ft.	ins.	
3	0	52 8	7	6	330 4	16	0	1503 9
3	6	71 9	8	0	376 0	18	0	1903 3
4	0	94 0	8	6	424 4	20	0	2349 9
4	6	118 9	9	0	475 8	22	0	2843 3
5	0	146 9	10	0	587 4	24	0	3383 8
6	0	211 4	12	0	845 9	26	0	3971 3
6	6	248 1	12	6	917 8	28	0	4605 8
7	0	287 8	14	0	1151 3	30	0	5287 3

### Standard Inside Depths

Ft.	Ins.	Ft.	Ins.	Ft.	Ins.	Ft.	Ins.	Ft.	Ins.
1	5	3	5	6	5	11	5	19	4
2	0	4	0	7	5	13	5	21	4
2	5	4	5	8	5	15	4	23	4
3	0	5	5	9	5	17	4	25	4

**Finish**—Staves dressed both sides. Edges machine jointed to proper bevel. Bottom dressed on top side only. Machine jointed straight and square and well dowelled. Staves crozed to suit the circle of the bottom and taper of the tank and to make a driving fit on the bottom. Bottom chamfered on under side and left slightly thicker to allow for shrinking, if any, before erection.

**Hoops**—Round hoops of wrought iron (not steel) with malleable iron draw lugs, with sizes and spacing to give a safety factor of 4 to 1 for each hoop, or heavier for special purposes when so specified, also brass, copper, galvanized, lead covered or other kind of hoops when specified.

## RECTANGULAR WOOD TANKS:

We have been building this style of tank for a great many years and were the first to perfect and adopt a standard method of construction which we have reason to believe, from long experience, is about the best possible method.

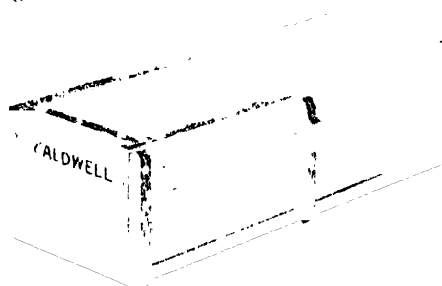
The bottom is crozed (or grooved) to receive the sides and ends and the sides are crozed to receive the ends. This gives wedged joints which are water-tight even without the pull of the rods.

*Continued on Next Page*

We build these tanks in any size wanted with or without partitions, false bottoms, etc., or with lead or other lining when required. The rodding is thorough and the sizes and spacing are carefully figured out by our engineering department to give a full factor of safety of 4 to 1 with the liquid used, so that no bulging is possible. All rods except the horizontal outside end rods pass through the wood.

Where the length exceeds certain proportions the sides are braced against bulging. The simplest and best method is by rods through the center of the tank and is used where their presence is not an objection, otherwise the sides are trussed on the outside by iron rods as shown in the illustration, or by a wood truss if the iron is objectionable.

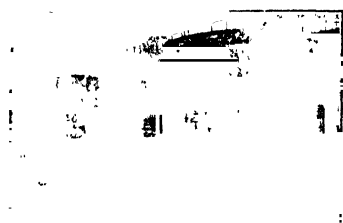
We can furnish brass, copper, bronze, galvanized, lead covered or Duriron rods. When required we countersink the nuts on top and cover with a hard-wood coping.



RECTANGULAR WOOD TANK

#### STEEL TANKS:

We make steel tanks in round, rectangular or any shape or size and carry a good stock of steel for the usual sizes and thicknesses. For round tanks the standard diameters and depths are in even feet and the standard thicknesses are, for 10 ft. diameter and under  $\frac{1}{8}$  in., 16 ft. diameter and under  $\frac{3}{8}$  in., 24 ft. and under  $\frac{1}{4}$  in. and above 24 ft. thicknesses to suit with  $\frac{1}{4}$  in. minimum.



STEEL TANKS SET UP IN SHOP

Rectangular steel tanks are made of slightly heavier material than for round tanks of the same capacity. They are thoroughly braced against bulging by angles and ties.

We can furnish steel tanks set up in the smaller sizes or knocked down, all punched, fitted and bent to shape with the necessary rivets.

All steel tanks are set up in the shop to insure correct fit. See illustration.

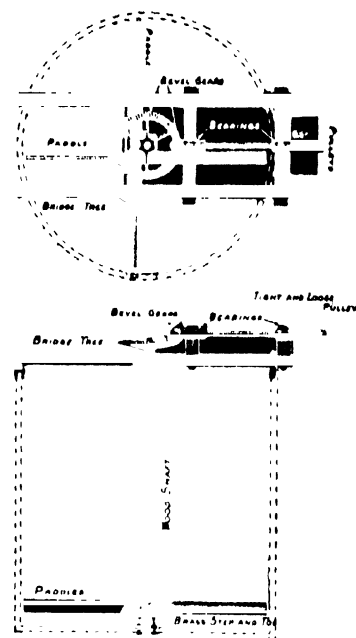
#### TANK AGITATORS:

We are the originators of this style of agitators and have been building them for a great many years.

All parts including those of iron, steel and brass are made in our own shops and are designed especially for this purpose insuring proper strength and fit.

Our agitators are thoroughly and substantially made and are designed for mixing, stirring and holding in suspension all sorts of solutions and mixtures including dense and plastic materials.

The standard sizes have dimensions of the machinery and other parts proportioned to the diameters and depths of the tanks in which they are used, assuring the proper strength for all ordinary purposes. For heavy service we make special designs to suit.



TANK AGITATORS

Pulleys, Sprocket, Gears or Friction Clutch can be used

We make these agitators to fit wood or steel tanks.

Our standard design consists of steel shafts and winged stirrer arms, heavy cast iron gears, step and toe bearings, anchors and bolts with long leaf yellow pine millwright timbers across the top of the tank; all framed and finished with all holes bored and bearings set all ready to attach to the tank which any ordinary workman can do even without the blue prints we furnish.

Where the substance to be stirred will injure the ironwork or be injured by it, we make the vertical shaft and winged stirrer arms of wood and the step and toe bearings, bolts, nuts and washers of brass, bronze, Duriron or other acid resisting metal.

The proper speed in most instances is 500 to 1000 ft. per minute at ends of stirring arms.

We also make complete mixing and processing tanks

#### AMONG OUR CUSTOMERS ARE:

Edison Chemical Works, Silver Lake, N. J.  
Maas & Waldstein Co., Newark, N. J.  
General Chemical Co., New York City  
Aetna Explosives Co., New York City  
E. I. Du Pont De Nemours and Co., New York City  
Standard Aniline Products Co., New York City  
Virginia-Carolina Chemical Co., Richmond, Va.  
Rollin Chemical Co., Charleston, W. Va.  
Warner-Klipstein Chemical Co., Charleston, W. Va.  
American Agricultural Chemical Co., New York City  
Roessler & Hasslacher Chemical Co., St. Albans, W. Va.  
Ammono-Phos Corp., New York City.

# THE CANNON-SWENSON COMPANY

Consulting, Designing and Contracting Engineers

53 W. Jackson Boulevard

CHICAGO, ILLINOIS

## SERVICE

Our service consists of the following:

## CONSULTATION

Reports on proposed new enterprises as well as the remodeling of old ones.

Recommendations as to advisable changes in inefficient factories or plants.

Appraisals and confidential reports for banks or other fiscal agents.

Cooperation assisting clients in organizing operating force.

## CONSTRUCTION

We are equipped to design, engineer and supervise construction of complete industrial factories or plants.

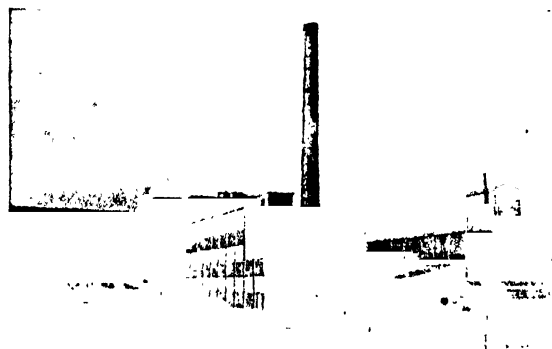
We are also prepared to contract for such factories or plants on percentage or lump sum basis.

The Cannon-Swenson Company offers a complete organization for the construction of Chemical plants in particular.

This service includes designing, purchasing and inspection of all materials, construction, installation of all machinery and equipment, and operation.

## STAFF

The staff includes seasoned engineering specialists of wide field reputation for work **well done**. Their engineering counsel and judgment is backed by years of practical experience.



KOREAN BEET SUGAR COMPANY, PING-YANG, KOREA

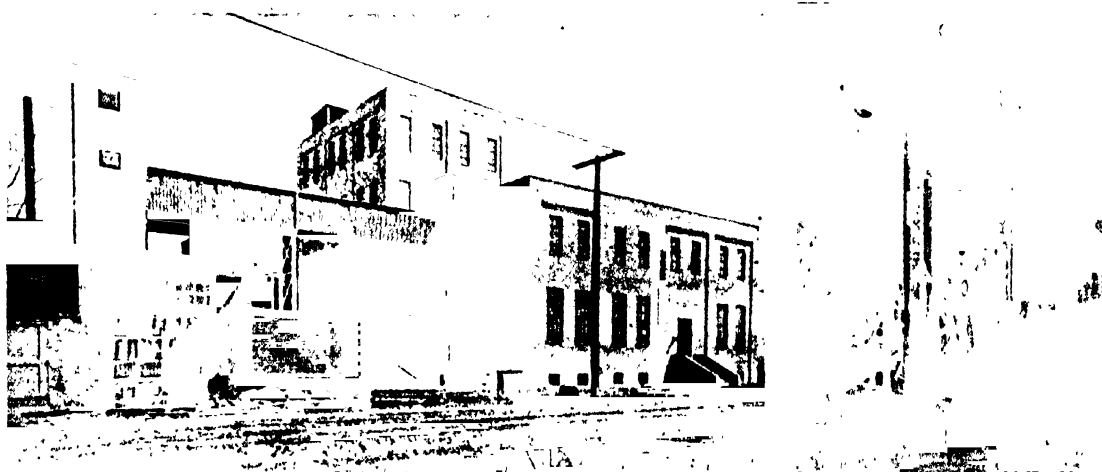
Successful operation, 1920, for Japan Sugar Co.



LIME KILN AND HOUSE

*Continued on Next Page*





Factory Buildings Tanks and Continuous Filter  
**FACTORY FOR MANUFACTURE OF TRISODIUM PHOSPHATE AND GLAUBER SALT**

### EXPERIENCE

Our experience covers the industrial engineering field thoroughly and we can particularly refer to extensive experience in the following.

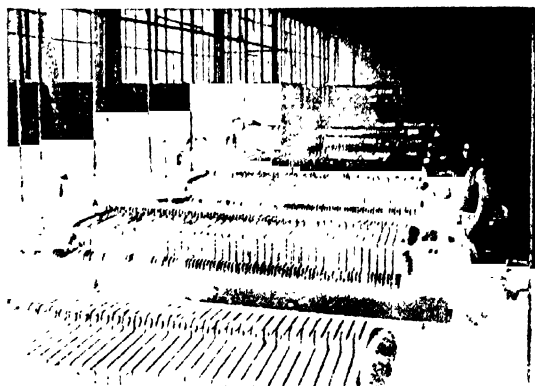
Complete factories and plants for manufacture of:

Beet Sugar and By-Products	Caustic Soda
Cane Sugar	Calcium Chloride
Maltose Sugar	Salt
Potash	Chemical Wood Pulp
	Refineries

Complete wood distillation plants and by products:

Wood Alcohol	Formaldehyde
Acetate of Lime	Turpentine
Acetone	Rosin Oils
Acetic Acid	Tanning Extracts

If you are considering the erection of new plants, plant extensions or improvements—or if you are interested in gaining increased plant efficiency and production—it is probable our wide experience will prove of value and service.



**FILTER PRESS STATION**



**CONTROL LEVEL, DIFFUSION BATTERY**

# CARRIER ENGINEERING CORPORATION

Specialists in Air Conditioning and Drying

750 FRELINGHUYSEN AVENUE, NEWARK, N. J.

## BRANCH OFFICES

New York 39 Cortlandt Street  
 Boston 176 Federal Street  
 Buffalo Prudential Building  
 Philadelphia Land Title Building  
 Chicago Transportation Building



## SERVICES AND PRODUCTS

Consultation, Designs, Construction, Equipment and Installation, complete or in part, of plants for the purpose of Humidifying, Dehumidifying, Cooling, Air Washing, Automatic Temperature and Humidity Regulation, and Drying. Designs and Complete Installation of Process and Power Piping Systems.

Carrier Apparatus, during seventeen years of constant research and development, by the pioneer engineers in air conditioning, has won its place in more than one hundred distinctly different American industries, comprising more than a thousand separate installations. Wherever weather, or atmospheric condition, affects the efficiency of the manufacturing process, or the production capacity of labor, Carrier Apparatus will manufacture weather to order, providing an automatically and positively controlled temperature, humidity, purity, and air distribution. In any one of its thousands of applications Carrier Apparatus is guaranteed to produce the results for which it is installed.

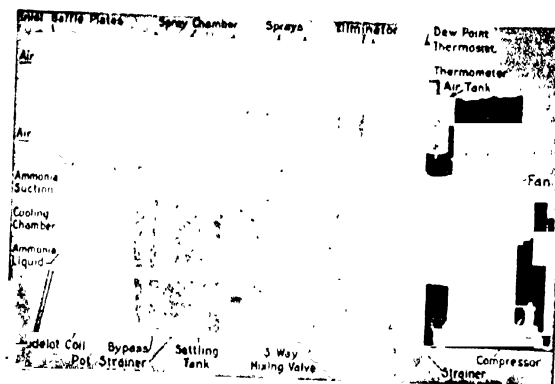
An engineering staff of trained experts is at the disposal of our clients. A Department of Research and Development, with an adequate personnel and complete facilities, is ready to investigate new applications in any industry.

## AIR CONDITIONING

Air Conditioning involves four principal factors: the control of temperature, humidity, purity, and the effective distribution of air. Experience, in hundreds of instances, has shown that the effects of air, upon the process, or upon the worker, depend upon the humidity rather than the temperature. Normal atmospheric air varies from a moisture content of a fraction of a grain per cu. ft., in the winter, to as much as ten grains per cu. ft., in the summer. Winter air contains so little moisture that water-vapor must be added to produce a condition conducive to health, and suitable for the promotion of process efficiency, wherever the product is affected by moisture in the air. The addition of moisture to the air is usually termed "humidification." Humidifiers produce their effect by spraying warm water into the air passing through the machine. The temperature of the water determines the degree of saturation of the air. Automatic control instruments are provided, which are actuated by the saturation temperature of the air leaving the humidifier, and which control the temperature of the spray water. This control is positive and entirely automatic.

Summer air oftentimes contains too much water-vapor for comfort, or for the successful operation of manufacturing processes. During the summer the temperature, also, may be too high to permit efficient operation. The process of removing part of the moisture in the air, and lowering its temperature when de-

sirable, is termed "dehumidification." Dehumidifiers produce their cooling and drying effect by spraying cold water into the air as it passes through the machine. This cold water may be obtained from wells or other natural sources, or it may be cooled by mechanical refrigeration. The control operates as in the humidifier, except that the control valve regulates a 3-way cold water mixing valve, instead of a steam heater valve.



SECTION OF TYPICAL CARRIER DEHUMIDIFIER

When the air leaves either the humidifier or the dehumidifier it is saturated to a definite, controlled percentage of Relative Humidity, and, in winter, passes over steam heaters which bring it to a controlled temperature before admitting it to the kiln or building, as the case may be. The temperature control instrument is located in the area being conditioned. It is a duplicate of the instrument which controls the humidity. In summer, where no mechanical refrigeration is necessary, the heaters are, of course, cut off, and the air blown from the humidifier directly into the building. This air will enter the building from 10° to 25° cooler than the outside air, due to the cooling effect of evaporation in the humidifier. This cooling effect is obtained without additional operating expense and without changing the adjustment of the apparatus.

Air Conditioning has proven itself a dependable ally in many of the most important American industries. For the control of moisture regain, for effecting fractional crystallization, for cooling, for heating and ventilating and conditioning, for drying, either as applied to the unit or the progressive type of dryer, for humidifying, and for dehumidifying, Carrier Apparatus can be designed to meet any requirement and to reduce the technical control of atmospheric conditions to a practical and efficient mechanical basis, as simple and positive as the control of heat with the pyrometer.

Our bulletins are a liberal education in Air Conditioning. They are gratis, upon request. Address the New York Office.

## FRED S. CARVER

Mechanical Engineer and Manufacturer  
of Hydraulic Equipment for Special Uses

8 WEST 40TH STREET, NEW YORK, N. Y.

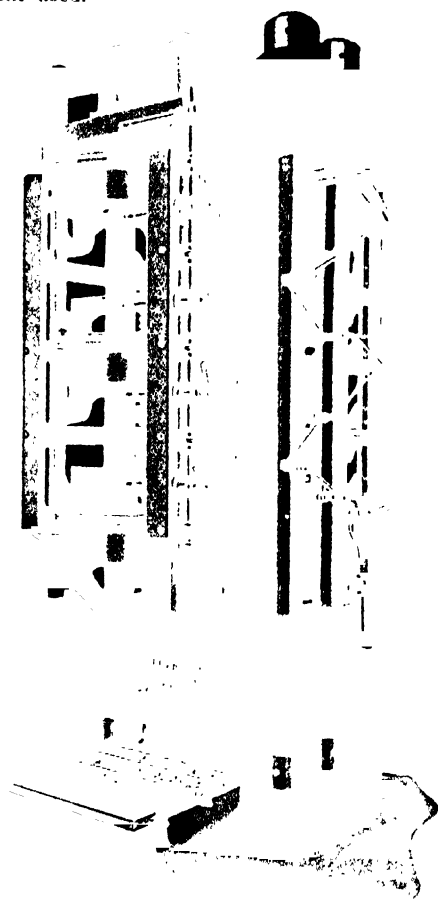
### PRODUCTS

Hydraulic Presses for extraction of oils and for certain other purposes; also Cocoa Butter Presses and the Carver Accumulator System adapted especially to operation of oil presses, hydraulic valves, fittings, etc.

We lay out and furnish complete hydraulic equipments for this work.

### CARVER OIL PRESS

This is a type of oil press which, due to certain features of its design, will extract higher percentages of oil from a given material than any of the presses at present used.



CARVER OIL PRESS

### USES

These presses are made in a number of sizes and models adapted to handle most of the oil bearing seeds and materials requiring extraction by hydraulic pressure. Their introduction for use on materials on which the value of the oil is high and the pressed cake is low is exceedingly profitable. Gains of 1% to 10% in oil extracted can be had under various conditions and often this means additional profits at first hardly believed possible.

This type of press, which we have been the first to build in this country, was developed first for pressing cocoa butter, which is most exacting in its requirements. The presses are equally well adapted to pressing linseed, copra, cottonseed, peanuts, soya beans, corn oil and various of the other oil bearing materials, seeds, nuts, etc. Certain modifications as to details are required for the different materials but on all the very highest yield of oil will be obtained and whatever additional profit this means.

### PRINCIPLE

The material to be pressed is confined in a series of cylindrical pot units and a higher pressure is exerted on it than in any of the presses at present being used in the oil industry. Thus the cakes are confined at the edges and receive this high pressure uniformly, there being no more oil left in edge of cake than in any other part. Filter pads or strainers are flat and on top and bottom of cake only, so are not stretched and torn by spreading of cakes as in other presses. Thus all the material is uniformly pressed to the greatest practical extent, giving up a maximum yield of oil.

### GENERAL DESCRIPTION

We make these machines in two sizes, best adapted for general quantity production. These are varied as to certain details of equipment for different materials. They are thoroughly standardized and fully developed machines, most of the new developments being covered by patents.

We can furnish presses with automatic filling equipment for materials that can be pumped and can equip them to eject the cakes automatically for large quantity production in any material.

Filter pad expense is a relatively small item for these presses, when pads are used, and for a number of materials no pads will be required and for others metallic strainers can be used.

We have developed a special type of accumulator system, for operation of these or presses of any type, which is a radical improvement over the weighted types that have been generally used, reducing trouble and increasing production.

### INQUIRIES

It is our belief that the use of these presses in most lines of oil pressing will produce very large increased earnings.

In addition to the above described line of machines we have developed others along somewhat different lines for certain specific requirements in work of this character.

We shall be glad indeed to receive inquiries as to any given material, with as complete information as possible as to its nature, present method of handling, if any (with pressure used on it), oil content, etc. On receiving such inquiries we shall be glad to advise as to what might be expected from our equipment and to offer a detailed proposition whenever its use would be to our mutual advantage.

We will also welcome opportunities to quote on our Hydraulic Accumulator System to operate any oil mill.

# CELITE PRODUCTS COMPANY

11 Broadway  
NEW YORK, N. Y.

Philadelphia Liberty Building  
Cleveland Guardian Building

Monadnock Building  
CHICAGO, ILL.

Detroit Book Building  
St. Louis Railway Exchange Building  
New Orleans Whitney Central Bank Building

Van Nuys Building  
LOS ANGELES, CALIF.

Denver, 16th and Champa Streets  
San Francisco, Monadnock Building

## PRODUCTS

Filter-Cel for Filtration

Sil-O-Cel for Heat Insulation

## SIL-O-CEL

**General Description and Use**—Sil-O-Cel, a light weight highly siliceous material produced in brick, blocks, powder and cement form is used to prevent heat penetration. Its insulating value is from ten to twelve times that of ordinary fire brick and is known to withstand temperatures that completely destroy other forms of insulation.

### Advantages of Insulation

- Prevents heat loss
- Increases the output of the equipment
- Saves fuel
- Insures better working conditions
- More accurate temperature control

**Boiler and Furnace Insulation**—Sil-O-Cel Insulating Brick are laid up between the fire brick and red brick courses in the setting usually to a thickness of 4½ inches. Sil-O-Cel insulation will effectively prevent the loss of heat through the setting and provide a cool exterior surface.



**Sil-O-Cel Insulating Powder**—This form has the same insulating qualities as Sil-O-Cel Brick but is used where brick is not adaptable for insulating, such as—hot blast stoves, gas generating equipment, doors of ovens and boilers. It is also used for fire proofing and sound deadening in building construction.

**Sil-O-Cel C-3**—A semi-refractory material of high insulating value, prepared in granular form. When suitably bonded by the addition of 20 per cent by volume of Portland Cement (process patented) and moistened slightly, this material is ideal for insulating furnace bases, doors, etc. The mixture should be rammed into place.

**Sil-O-Cel C-22 Brick**—A semi-refractory type of Sil-O-Cel Brick made in standard fire brick sizes. Being free from shrinkage at high temperatures, will not spall with sudden temperature changes. They are recommended as an intermediate insulating course for the protection of the insulation under extreme temperature conditions.

**Sil-O-Cel Insulating Cements**—Adaptable for the insulation of irregular surfaces or in places where other Sil-O-Cel products are not adapted. They are prepared in three coats and applied as follows:

1. Sil-O-Cel Sticking Cement (First Coat) is used to produce a surface to which the second or insulating coat will adhere.

2. 85% Sil-O-Cel Insulating Cement (Second Coat) is the insulating coat, having unusually high insulating value and durability under heat.

3. Sil-O-Cel Hard Finish Cement (Third Coat) is used to give the work a smooth, hard, durable finish.

These cements are used to insulate boiler drums, evaporators, vulcanizers, storage tanks, flues, breechings and other heated surfaces.

### Application—

Annealing Furnaces	Enameling Ovens	Kilns
Annealing Pits	Furnace Doors	Malleable Furnaces
Bake Ovens	Gas Generators	Marine Boilers
Boiler Settings	Gas Producers	Metal Mixers
Bustle Pipes	Heat Treating Equipment	Oil Stills
Coke Ovens	High Temperature Flues	Pipe Covering
Core Ovens	Hot Blast Mains	Regenerators
Dryers	Hot Blast Stoves	Soaking Pits
Dust Catchers	Hot Metal Cars	Tanks and Vats
Electric Furnaces	Japanning Ovens	Waste Heat Boilers

## CELITE HIGH TEMPERATURE CEMENTS

These are mixtures of ceramic materials scientifically compounded for laying, facing and patching fire brick work in boiler settings, furnaces, etc. They set up under the action of heat making a bond structurally as strong as the fire brick with absolutely no shrinking or swelling. Celite High Temperature Cements bond the refractory together, making a solid monolithic structure.

## CELCOTE

An elastic, adhesive cement used to prevent air infiltration and also as a waterproofing coat for Sil-O-Cel insulation.

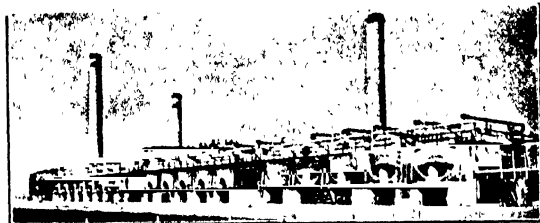
## ENGINEERING SERVICE

Detailed information on any specific insulating problem will be furnished by our engineering department. Bulletins containing engineering data on any of the above types of equipment will be sent on request.



BOILER SIDE WALL INSULATED WITH SIL-O-CEL INSULATING BRICK

**Insulation of Stills**—By insulating stills and still settings, higher efficiency, increased output and more accurate, even control of temperature are obtained.



BATTERY OF STILL INSULATED WITH SIL-O-CEL BRICK AND INSULATING CEMENTS

## SIL-O-CEL INSULATING PRODUCTS

**Sil-O-Cel Insulating Brick**—Made in standard fire brick sizes and are used as an insulating backing for the fire brick in all types of high temperature equipment.

**Sil-O-Cel Blocks**—Made in sizes 6x36 and 6x18 inches, 1, 1½, 2 and 3 inches thick. They are a bonded form of Sil-O-Cel suitable where a high temperature insulation is required in large sections.

*Continued on Next Page*

**FILTER-CEL**

Filter-Cel is a porous siliceous filtering material prepared in powdered form. It is inert and insoluble in solutions of mineral or organic acids, salts and organic solvents and can be used in all types of filters. When lightly packed, Filter-Cel weighs only eight pounds per cubic foot. Due to its lightness of weight and the large surface area of its particles, Filter-Cel can be readily mixed to a uniform suspension in liquids. It can be used to advantage in the filtration of any character of product resulting in greater clarity and increased capacity with a reduction in labor.

**Method of Using**—Filter-Cel is thoroughly mixed with the turbid liquid prior to filtration. The quantities used ordinarily vary from one-tenth to one-half per cent, on the weight of the liquid according to the nature and quantity of suspended matter present. The suspension is then pumped through the filter, the Filter-Cel and the suspended solids being completely retained on the filter cloth or other retaining medium. As the filtration continues, additional Filter-Cel is automatically deposited along with the suspended matter providing a continual renewal of the filtering surface, the resultant porous filter cake itself acting as a most effective filter.

It is often advisable to use a larger percentage of Filter-Cel in the first liquid entering the filter to protect the cloths from the slimy precipitate and to eliminate the danger of the liquid running cloudy at high pressures.

**Action**—As filtration is a process of straining, the finer the strainer the more perfect the filtration.

The action of Filter-Cel in general is a purely physical one, having a microscopic porosity it affords the best means of getting more complete retention of suspended matter than is possible with any other method of filtration, and at the same time provides channels which permit a more rapid flow of the liquid.

Filter-Cel is especially valuable in pressure filters of all types.

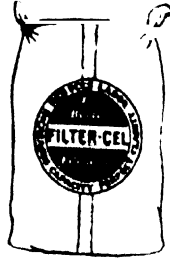
**Improving Filtration**—Practically all difficulties in filtration processes are due to the cake or solids forming an impervious coating on the filter cloth.

This is particularly the case when suspensions of a gelatinous and colloidal nature are filtered. The continuous addition of Filter-Cel neutralizes this clogging action by providing fresh filtering surfaces and a porosity of filter cake that allows filtration to proceed without the rapid retardation usually encountered.

**Advantages**—The most important result to be derived from the use of Filter-Cel is the perfect quality of the filtration.

Further advantages are the increase in the capacity of the filter through obtaining a greater flow of liquid per unit of filtering area, or through lengthening the filtration period or cycle or both. This usually also results in a saving of labor. Filter-Cel cakes are easier to remove, and in many cases the filter cloths can be reused without washing, thus resulting in additional saving of time and labor. It is not only possible but is a distinct advantage to use a lighter grade of filter cloths when using Filter-Cel.

Due to the porosity of Filter-Cel press cakes, the valuable solutions may be washed out with a minimum quantity of solvent and the recovery thereby increased.

**Applications**

The following liquids are filtered with Filter-Cel on a large scale

Adhesives	Flavoring extracts	Milk sugar
Alcoholic extracts	Fruit juices	Molasses
Antitoxins and serums	Glucose	Peanut oil
Cane syrup	Glycerine	Pharmaceuticals
Caster oil	Grapefruit juice	Shells
Cereal beverages	Lemon juice	Soap lye
Cider	Lime juice	Sorghum syrups
Cocunut oil	Mustard oil	Soya bean oil
C. P. chemicals	Liquid soap	Stearic acid
Corn oil	Lubricating oil and used automobile oils	Tartaric acid
Cottonseed oil	Maltose	Vanillin and
Citric acid	Metallurgical solutions	Vinyl acetate
Dyestuffs		Wine
Fish oil		

The following paragraphs explain briefly the methods of filtration and quantities of Filter-Cel used.

**Vegetable Oils**—Cocunut, cottonseed, olive, peanut and rapeseed oils require complete clarification before hardening or marketing. This can be rapidly obtained by filtration with small quantities of Filter-Cel. Ordinarily 1/10 to 1/5% of Filter-Cel added just before filtration, is sufficient to obtain a rapid flow from the filter and a perfect separation of impurities.

Filter-Cel makes possible the filtration of these oils at reduced temperatures and thus insures permanent clarity.

**Chemicals**—The color and purity of many chemicals can be improved by giving their solutions a filtration with Filter-Cel before crystallization. This completely removes all suspended impurities, dust particles, etc., and permits the formation of crystals without contamination.

**Syrups**—Table syrups such as cane, sorghum, maltose, glucose and molasses often contain very finely divided suspended matter which renders the products unsalable or causes them to be classed as second grade. Quantities of Filter-Cel ranging from 1/10 to 1/2% make it possible to filter rapidly and obtain bright, sparkling products. In some cases, the use of lime and sulphur dioxide can be dispensed with, and the product simply given a filtration with Filter-Cel. In this way, contamination and impairment of the flavor are avoided.

**Dyestuffs**—These products must be clarified completely in the intermediate processes of manufacture so that the final products will have the highest possible purity. Filter-Cel is used effectively to remove amorphous sulphur, iron oxide, zinc sludge, carbon, pitch and other residues. Filter-Cel has made possible a sharp separation between solids and liquids and thereby increases the extraction and recovery of these products.

**Cereal Beverages**—Products of this character must be filtered perfectly not only for the sake of the appearance of the product, but also to insure the complete removal of yeast. This is especially important for products shipped in bulk or in kegs and that cannot be pasteurized. Filter-Cel in quantities of from 1/4 to 1/2 oz. per gallon of beverage is thoroughly mixed with the beverage as it is drawn from the fermenting vats and just before filtration in a pressure filter.

**SERVICE**

This company will gladly extend the advice and assistance of its technical staff without obligation. Our laboratory will filter samples of your product and submit them for your inspection together with complete data on the process. Samples of Filter-Cel for testing and experimental use may be obtained upon request.

# CARY MANUFACTURING COMPANY

Manufacturers of Packers and Shippers Specialties

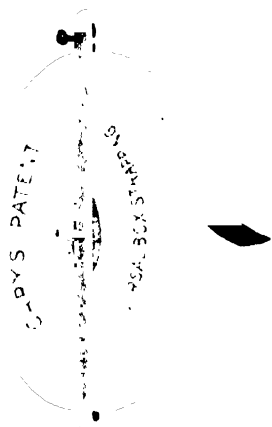
MANHATTAN BRIDGE PLAZA, BROOKLYN, N. Y.

## PRODUCTS

"Universal" Box Strapping, Box Corner Fasteners, Bung Fasteners, Twisted and Self Tightening Round Wire Box Strap, Flat Wire Box Strap, Bale Buckles and Bands, Saw Edge and Plain Edge Divergent or Parallel Corrugated Fasteners, Protective Seals, Wire Clasps, Flexible Steel Matting.

### BOX STRAPPING "UNIVERSAL"

Universal Box Strapping is made from soft annealed steel, through which nails can be easily driven without first punching a hole. This strapping is made in widths of  $\frac{1}{2}$ ,  $\frac{5}{8}$ ,  $\frac{3}{4}$  and one inch, put up in reels of 300 feet each, packed 20 reels to a case, also supplied in lengths cut to specifications.



REEL OF "UNIVERSAL" BOX STRAPPING

### BOX STRAPPING WIRE "SELF TIGHTENING"

Our Self Tightening Wire Box Strapping is made in sizes of No. 14, 15, 17 ga. coppered or galvanized round wire. Put up in reels of 5000 feet, also in lengths cut to specifications.



SECTION OF "SELF-TIGHTENING" BOX STRAPPING WIRE

### BOX CORNER FASTENERS

Our Box Corner Fasteners are manufactured from the finest grade of Hot Rolled Strip Steel, insuring a finished product that will drive into wood and hold.

These fasteners are made in numerous styles and sizes. Our "Teeth" style being illustrated.



"TEETH" STYLE BOX CORNER FASTENER

### CORRUGATED STEEL FASTENERS

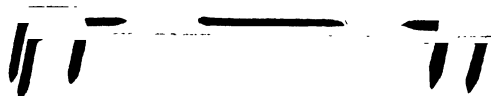
Our Corrugated Steel Fasteners have a **Continuous Cutting Edge**. We are sole owners and exclusive manufacturers of a Saw Edge Corrugated Steel Fastener with a **Continuous Cutting Edge**; patents, process and machines being controlled by this company. Made in various widths and corrugations, also put up in coils for machine driving. Our cut fasteners are packed 500 and 1000 to a tin container or packed in bulk.



Divergent Parallel Divergent  
CORRUGATED STEEL FASTENERS

### SKELETON CLASPS

Our Skeleton Clasps are used extensively on small cases, boxes, tubs, etc. This clasp bends squarely around corners of boxes without fracturing. Made in five sizes, 2" to 3 $\frac{1}{4}$ " inclusive.



SKELETON CLASP

### PROTECTIVE SEALS

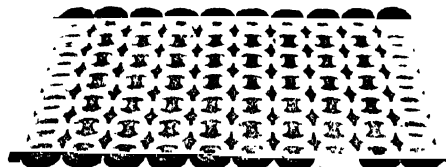
An efficient guard against pilferage. Made in sizes of  $\frac{1}{2}$  and  $\frac{5}{8}$  inch.



PROTECTIVE SEAL

### STEEL DOOR MATS "EVERLASTING"

Made from the best grade of Cold Rolled Strip Steel, thoroughly galvanized before being assembled. Made in twelve stock sizes, also irregular sizes to order. Used in elevators, entrances, corridors, factories, residences, anywhere that dirt and wet prevail. Send for sample and special literature.



"EVERLASTING" STEEL DOOR MAT

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# CHATTANOOGA BOILER & TANK COMPANY

Main Office and Works  
CHATTANOOGA, TENN.

---

## PRODUCTS

**Tanks for all General and Special Purposes:**

**Tanks for the manufacture and storage of Sulphuric, Nitric and Mixed Acids.**

**Tanks for the manufacture and storage of Benzol and Toluol.**

**Creosote Tanks.**

**Grain Tanks.**

**Ice Tanks.**

**Rendering Tanks.**

**Gasoline, Oil and Petroleum Product Tanks.**

**Cottonseed Storage Tanks.**

**Bleaching Tanks.**

**Kier Tanks.**

**Paper Manufacturing Tanks.**

**Silicate Soda Tanks.**

**Alum Manufacturers' Tanks.**

**Soap Stock, Rosin and Brine Tanks.**

**Molasses and Sugar Tanks.**

**Barium Process Tanks.**

**Tanks for manufacture and storage of Green Gum or Wood Turpentine.**

**Water Tanks, Towers and Standpipes.**

**Bins.**

## ACID TANKS

The various steps in acid processes can not be handled with the same material. Any material from steel to lead lined tanks is furnished. Also, cooler frames of steel or shipped complete with lead coils and lining. Acid work is a very important subject, and our plant is specially equipped to render the latest and best practice.

## TOWERS, TANKS AND STANDPIPES

The consulting department will advise whether towers and tanks, or standpipes, are the most economical for condition presented.

## BINS

For the storage of various materials.

## STOCK SHIPMENT

We carry a large stock of plate and other necessary materials, and are prepared to ship promptly tanks up to 500,000 gallons capacity.

## CO-OPERATION AND SERVICE

This company makes a specialty of tank design and construction, and has spent and is spending much money and time on mechanical and chemical investigation.

Experience places it in a position to offer valuable advice on tanks required for all general purposes. In the consulting department is one of the country's most capable and successful chemical engineers, who can be consulted for special propositions.

With this service and an up-to-date shop, the company gives more value, from beginning to end, than is obtainable elsewhere.

With an immense stock of materials, quick shipments, together with other advantages, are guaranteed.

## ESTIMATES, ETC.

Information and estimates will be furnished on request.

# CARY MANUFACTURING COMPANY

Manufacturers of Packers and Shippers Specialties

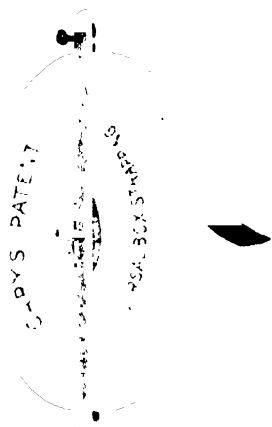
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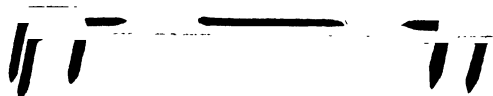
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Divergent Parallel Divergent  
CORRUGATED STEEL FASTENERS

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SKELETON CLASP

### PROTECTIVE SEALS

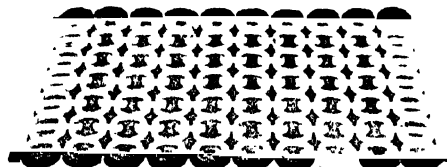
An efficient guard against pilferage. Made in sizes of  $\frac{1}{2}$  and  $\frac{5}{8}$  inch.



PROTECTIVE SEAL

### STEEL DOOR MATS "EVERLASTING"

Made from the best grade of Cold Rolled Strip Steel, thoroughly galvanized before being assembled. Made in twelve stock sizes, also irregular sizes to order. Used in elevators, entrances, corridors, factories, residences, anywhere that dirt and wet prevail. Send for sample and special literature.



"EVERLASTING" STEEL DOOR MAT



Will handle 5000 cubic feet of air per hour, consuming about 10 watts or 1.80 H.P.

Automatically the fan disc is opened and closed and can be applied to all sizes.

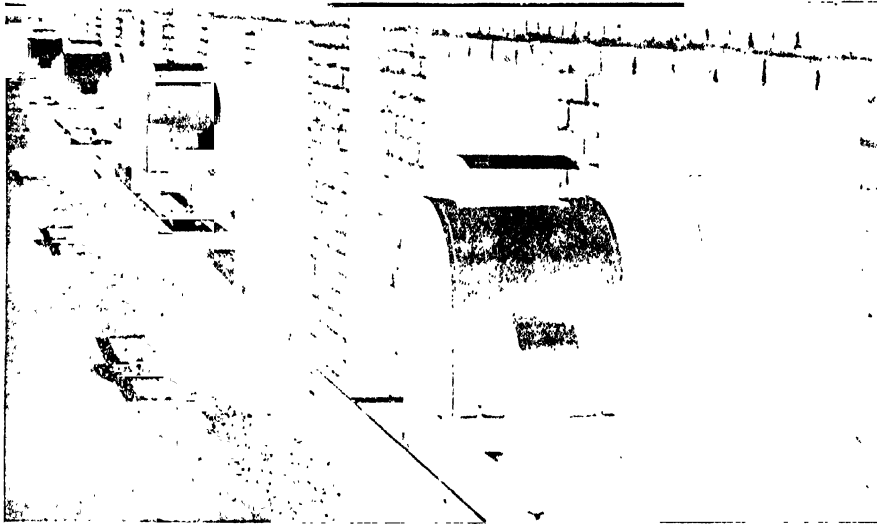
#### **FOUR LEAF CLOVER BLOWERS AND EXHAUSTERS**

Four Leaf Clover Blowers and Exhausters represent a new departure in blower construction, having

construction of the blast wheel and housing are unsurpassed for efficiency, large capacity, rigidity, durability and positive action.

Greater efficiency with reduction in power consumption for a given amount of air handled is one of the salient features.

Built for volume or pressure with bottom horizontal, top horizontal, up-blast and down-blast, discharge and



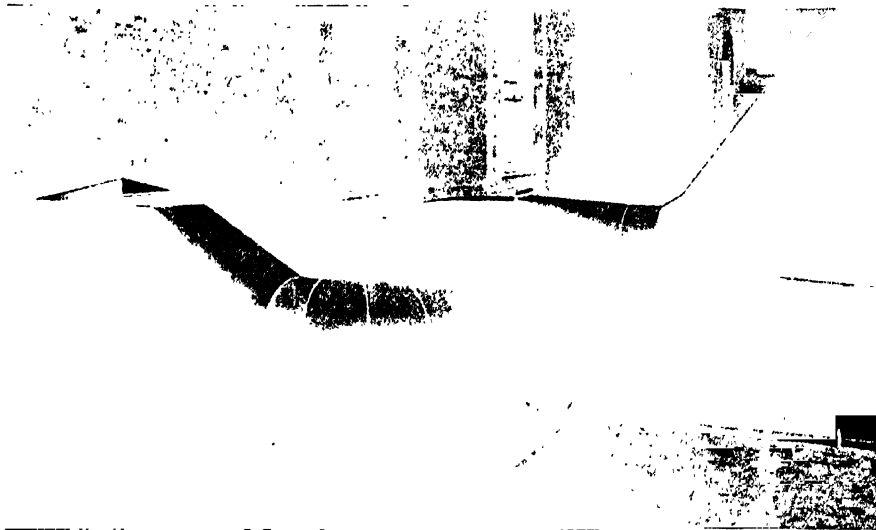
**OUTSIDE WALL INSTALLATION DISCHARGING ETHER FUMES**

been placed upon the market after extended and thorough investigation and tests.

They have a complete wide range of application for all blower and exhaust work and due to the scientific

for belt-drive or direct connection of motors, steam turbines or high speed engines.

There is a size for every requirement; capacity, tables and complete data sent on request.



**FOUR LEAF CLOVER BLOWER**

# CHEMICAL EQUIPMENT COMPANY

Engineers and Manufacturers

2451-59 SO. WESTERN AVE., CHICAGO, ILL.

## CECO

Trade-Mark  
Reg. U. S. Pat. Off.

### PRODUCTS

"Ceco" Valves; Centrifugal Pumps; Special Machinery; Spray Systems for Cooling, Evaporating, Air and Gas Washing, Gas Absorption; Evaporators. **VALVES**

Designed for Chemical Plant conditions. Seat can be removed, redressed or reversed. Has straight line contact which insures against any scale collecting on seat to prevent plug from closing tight. All operating threads protected from acids. Same valve can be used in angle or straightway position.

#### CECO VALVE ASSEMBLED IN THE STRAIGHTWAY POSITION

Valve	1"	1½"	2"	2½"	3"	4"
Face to face	7½"	9"	10½"	11½"	12½"	14½"
Dia. of flanges	4"	5"	6"	7"	7½"	9"

Dia. of bolt circle Drilled only to specification

The stem is of the rising type, freely hung so as to prevent turning when seating, and has no threads or other close fitting parts. The operating threads are within and always covered by the hand wheel. Threads of large pitch diameter are used thus insuring easy operation even with a small handle.

Compression on the packing is obtained by means of a single threaded gland follower having its threaded portion always covered by the handle. This avoids the use of the conventional but trouble some packing studs.

In order to obtain maximum life from the valve, both seating members are made removable and a type of seat is used which is practically self cleaning. The disk is reversible and may be easily redressed.

By making the body in two parts divided at an angle of 45° it is quite easy to convert this valve from angle to straightway or vice versa.

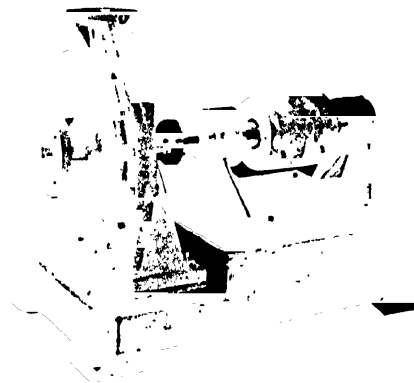
We not only furnish valves in the more common metals such as lead, iron, bronze, aluminum, monel, etc., but have also developed a number of special alloys which can be used.

Besides the valves shown we manufacture special acid resisting foot valves, check valves, tank bottom valves, and high pressure gas valves. Write for detailed descriptions.

#### CECO VALVE ASSEMBLED IN THE ANGLE POSITION

### PUMPS

For Acid Plant problems, with the smallest number of working parts and minimum cost to repair or replace. Deep stuffing box which can be packed easily. No end thrust on impeller. Cannot become gas- or steam-bound. Made belt drive or direct motor connected.



BELT DRIVEN PUMP

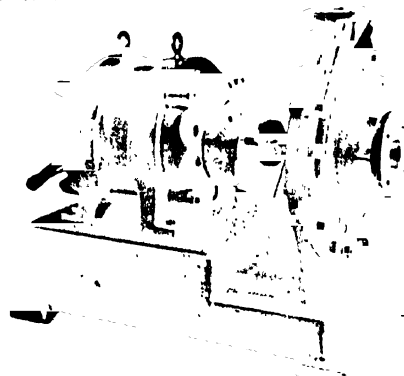
Pump	AA	A	B	C
Suction	1½"	2"	2½"	3"
Discharge	1"	1½"	2"	2½"
Normal cap. in G.P.M.	25	70	110	160

By properly designing the CECO horizontal pump we have been able to produce a unit from which all complication has been removed, and which stays in service.

Pumps are made of lead, iron, aluminum, bronze, monel, and other metals and alloys.

#### Data Required for Estimates

1. What liquid to be pumped?  
Give temperature and physical condition.
2. Gallons per minute to be pumped.
3. Total head, include losses
4. Suction lift in feet
5. Motive power, whether belt or motor drive. Give full electrical information



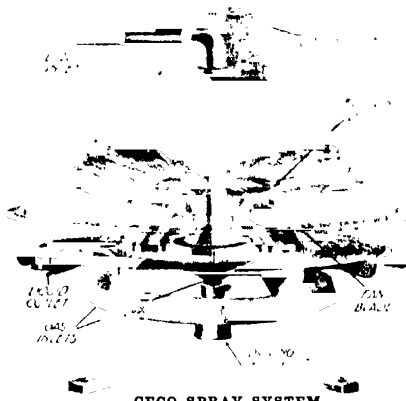
MOTOR DRIVEN PUMP

We also manufacture double stage pumps of a type similar to the above. Also blowers and exhaust fans for handling corrosive gases and vapors. Write for literature.

*Continued on Next Page*

## SPRAY SYSTEMS

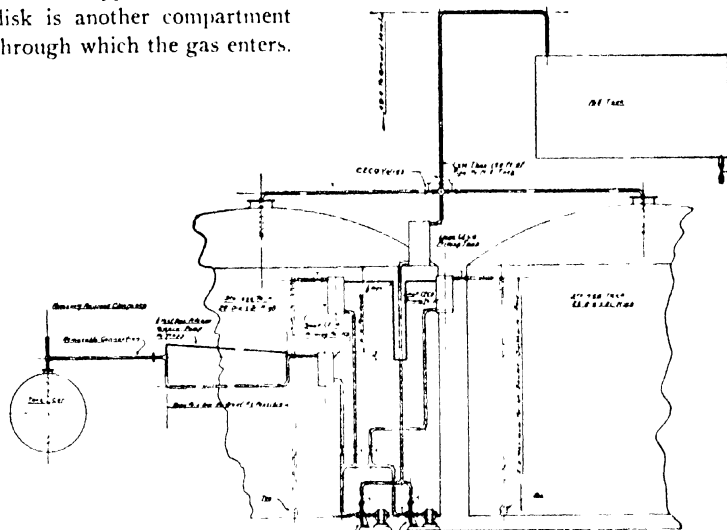
Adapted to Absorption of Gases in Liquids, Cooling of Gases, Gas and Air Washing, Liquid Cooling with Air or Gas. Evaporation problems and the deodorizing of oils.



CECO SPRAY SYSTEM

Dia of disk	0"	12"	24"
Dia of body	21 1/4"	42 3/4"	65 1/2"
Max height over all	20 3/8"	37 3/8"	54 3/8"

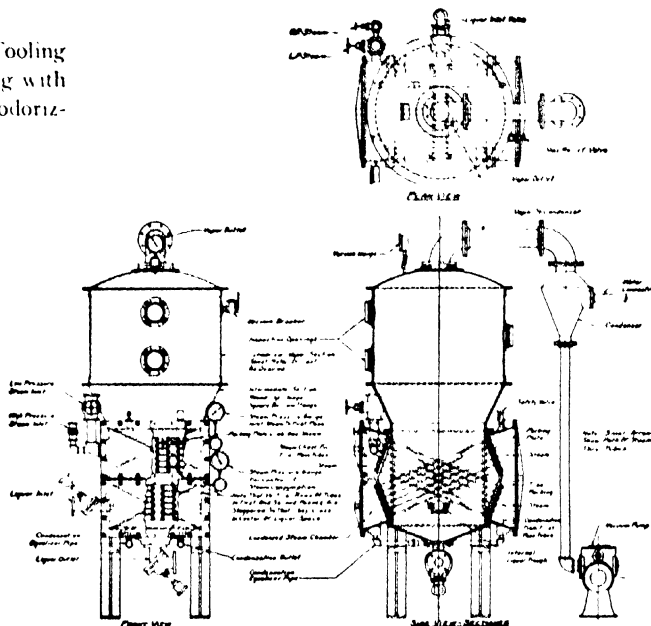
**Description**—A revolving disk is mounted on suitable bearings, provided with oil circulation and cooling if required. The disk is driven through a vertical shaft by a belt or motor. Surrounding disk is a compartment the upper wall of which is cone-shaped. Below disk is another compartment through which the gas enters.



CECO PUMPS AND AUTOMATIC PRIMING SYSTEM FOR UNLOADING TANK CARS OF ACID

**Operation:** (a) Take acid out of tank cars and deliver into either Storage Tank or into Mill Tank  
(b) Take acid out of top of either Storage Tank and deliver to Mill Tank or elsewhere if desired.

**Advantages:** (1) Low Initial Cost—Much less than air installation  
(2) Low Power Cost—Less than 1/2 the cost of air  
(3) Simple to Operate—No priming necessary—Automatic.  
(4) Leaks Avoided—Tank car not under pressure or vacuum.  
—Bottom outlet in Storage Tanks eliminated.  
(5) Ample Capacity—Will unload car in about two hours.  
—Will deliver to Mill Tank at any desired rate.



CECO VACUUM EVAPORATOR

## VACUUM EVAPORATORS

CECO Vacuum Evaporators are manufactured in single and multiple effects for evaporating liquors under vacuum and pressure by exhaust or live steam.

CECO return, downward, slanting tubes which are staggered, giving a natural flow of the condensation to the drains, leaving tube area free to transmit the heat to the liquid, also increasing the velocity of the steam through the tubes, giving a greater transmission of heat to liquid, and causing a more rapid and positive circulation of the evaporating liquid.

The liquor chamber is of rectangular shape with a minimum of liquor, which insures a much greater boiling capacity.

The vapor chamber is circular shape, giving maximum steam expansion area, insuring no entrainment, thereby doing away with all catchalls.

The liquid is brought into evaporator body by a special trough which distributes the liquid through the entire width of the evaporator, making an even distribution into the boiling liquid.

Tubes are so arranged that cleaning the bottom of the evaporator body can be done without removing the tubes

Condensation equalizing pipes from the back steam chest to the front steam chest and from the front steam chest to the drain pipe insures freedom of water in these parts.

# CHEMICAL EQUIPMENT COMPANY

Engineers and Manufacturers

2451-59 SO. WESTERN AVE., CHICAGO, ILL.

## CECO

Trade-Mark  
Reg. U. S. Pat. Off.

### PRODUCTS

"Ceco" Valves; Centrifugal Pumps; Special Machinery; Spray Systems for Cooling, Evaporating, Air and Gas Washing, Gas Absorption; Evaporators. **VALVES**

Designed for Chemical Plant conditions. Seat can be removed, redressed or reversed. Has straight line contact which insures against any scale collecting on seat to prevent plug from closing tight. All operating threads protected from acids. Same valve can be used in angle or straightway position.

#### CECO VALVE ASSEMBLED IN THE STRAIGHTWAY POSITION

Valve	1"	1½"	2"	2½"	3"	4"
Face to face	7½"	9"	10½"	11½"	12½"	14½"
Dia. of flanges	4"	5"	6"	7"	7½"	9"

Dia. of bolt circle Drilled only to specification

The stem is of the rising type, freely hung so as to prevent turning when seating, and has no threads or other close fitting parts. The operating threads are within and always covered by the hand wheel. Threads of large pitch diameter are used thus insuring easy operation even with a small handle.

Compression on the packing is obtained by means of a single threaded gland follower having its threaded portion always covered by the handle. This avoids the use of the conventional but trouble some packing studs.

In order to obtain maximum life from the valve, both seating members are made removable and a type of seat is used which is practically self-cleaning. The disk is reversible and may be easily redressed.

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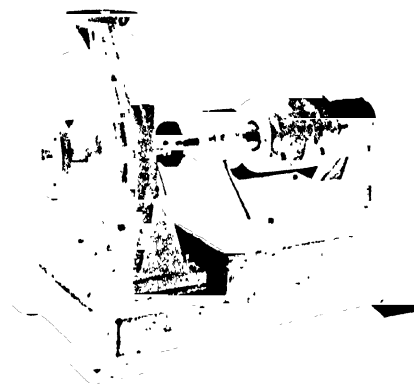
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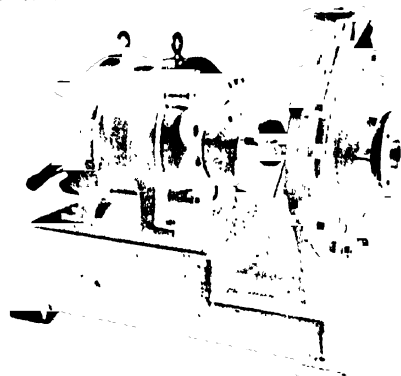
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*Continued on Next Page*

# CHESAPEAKE COPPERSMITH CO.

Manufacturers of  
Copper Chemical Equipment  
Kenwood Avenue and Elliott Street  
BALTIMORE, MD.

## PRODUCTS

Copper Chemical Equipment including:

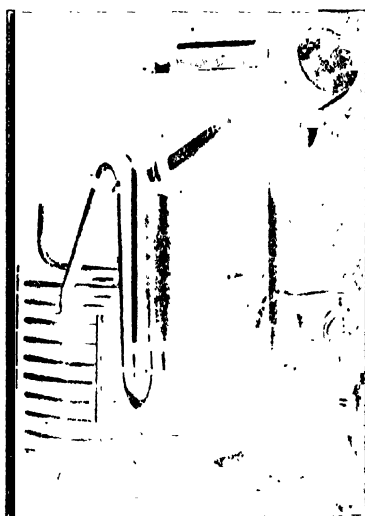
Autoclaves	Funnels
Coils	Percolators
Condensers	Stills
Copper Kettles, with or without Steam Jackets	Strainers
Digesters	Tanks
	Vacuum Pans
Varnish Kettles, etc.	

## EXPERIENCE

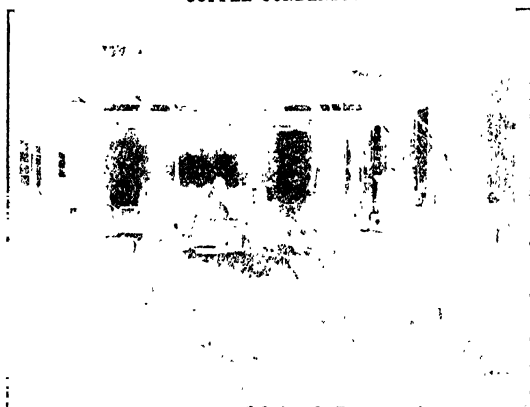
We have had a long experience in the manufacture of copper equipment used by all industries. As a result our copper-smiths are well trained, which insures superior workmanship in all classes of work.

## FACILITIES

Our plant is modern and well equipped in every particular, to build any kind of copper apparatus. We are pleased to quote prices at all times and prompt attention is assured.



COPPER CONDENSER



SHOP VIEW

## COILS

We are prepared to manufacture practically anything in the line of tube and pipe coils. A few uses to which our coils may be applied are the following:

Transformer cooling	Cooling
Acid-warming	Heating
Boiling	Evaporating

Condensing



COPPER COILS AND BENDS

## VACUUM PANS, MANUFACTURING SIZES

The capacities of these sizes range from 50 to 1000 Gals. The larger types are made with lugs on the sides, unless legs are specified in the order. All piping and valves are supplied and are standard. If floor space is limited special lengths of pipe and other connections can be delivered on the order. Receivers for the liquors are connected to a header so that various fractions can be recovered and separated without shutting down or interrupting the run. Attached to the agitator are two bevel gears, facing, so that by shifting the drive a counter-current can be set up and the contents thoroughly dehydrated.



CORNER OF SHOP

# CHESAPEAKE IRON WORKS

Steel Structures, Bridges  
Chesapeake Electric Traveling Cranes  
General Machine Work  
BALTIMORE, MD.

NEW YORK OFFICE: Singer Building

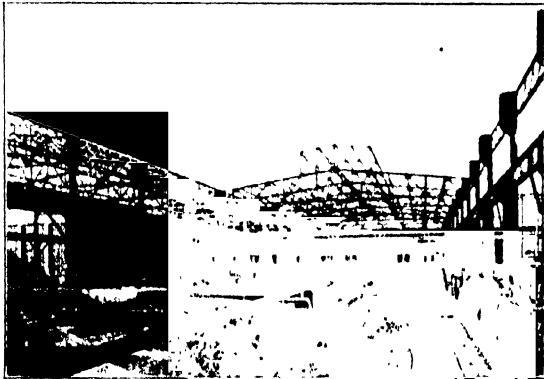
Cable Address: "CHES IRON"  
Baltimore, Md. Western Union Code

## PRODUCTS

Steel Structures and Bridges  
Electric Traveling Cranes  
General Machine Work

## STRUCTURAL STEEL WORK

We fabricate and erect steel structures of all descriptions, including bridges. Bethlehem and standard shapes carried in stock.



TANK BUILDING, BALTIMORE COPPER SMELTING & ROLLING CO., BALTIMORE, MD.

All steel work in this building furnished by Chesapeake Iron Works, Baltimore, Md.

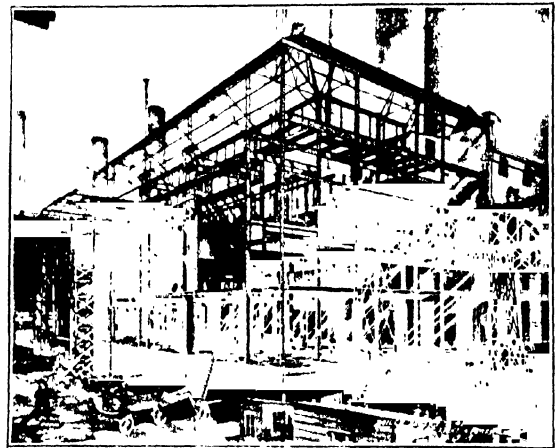
## THE "CHESAPEAKE CRANE"

"Most Rugged Crane Built."

All parts accessible and "standardized." Wearing parts extremely heavy for maximum life under adverse conditions. Ask for details.

## GENERAL MACHINE WORK

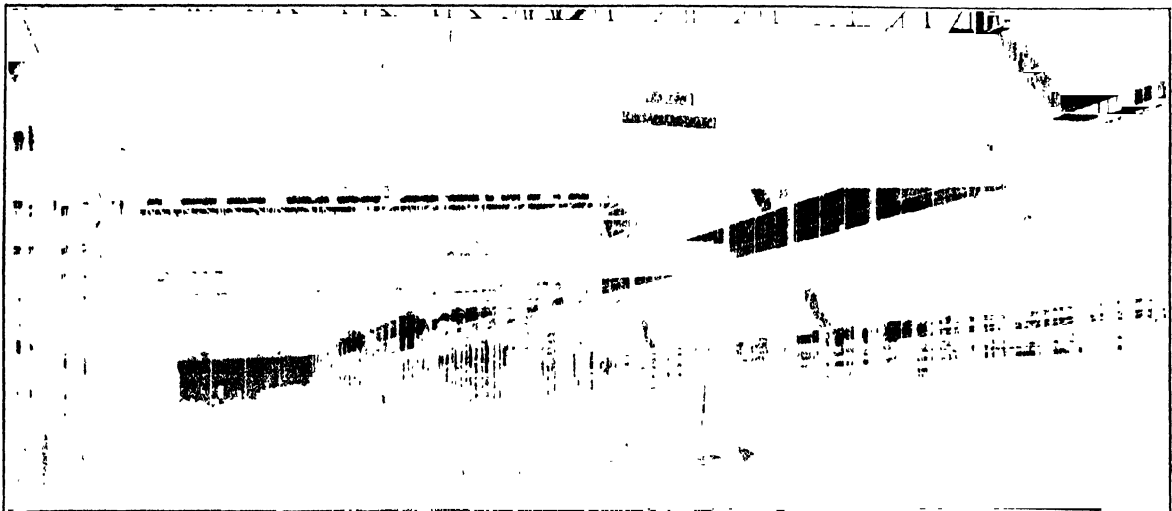
High efficiency machine shop facilities for outside companies not organized on "maximum production" basis.



WESTPORT POWER STATION BOILER HOUSE OF CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO., BALTIMORE, MD.

Over 90% of all steel work in this Power House furnished by Chesapeake Iron Works, Baltimore, Md.

This Westport Power House is the largest Electric Central Station under one roof south of New York.



TWO OF NINE CHESAPEAKE CRANES, EASTERN ROLLING MILLS, BALTIMORE, MD.  
25 tons each, 10 ton auxiliary hoist. Built by Chesapeake Iron Works, Baltimore Md.

# CHICAGO BRIDGE & IRON WORKS

Designers, Manufacturers and Constructors of  
Elevated Steel Water Tanks, Storage Tanks, Standpipes  
and Self Supporting Steel Stacks

Chicago, Ill., 2043 Old Colony Building  
New York, N. Y., 3142 Hudson Terminal Building  
Dallas, Tex., 1616 Pratorian Building  
Charlotte, N. C., 809 Realty Building  
Havana, Cuba, Edificio Abreu 402

## OFFICES

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Los Angeles, Cal., 1202 Wright & Callender Building  
San Francisco, Cal., 1005 Call Building  
Seattle, Wash., 95 L. C. Smith Building  
Montreal, Que., Can., 1055 Bank of Toronto Building

## WORKS

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Chicago, Ill.

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Greenville, Pa. (Pittsburgh District)

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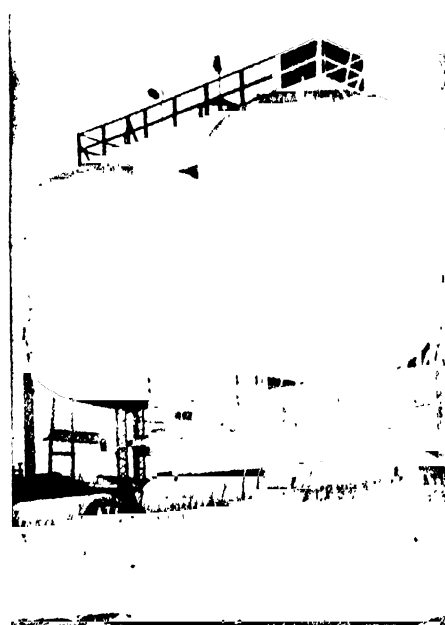
### STANDARD STORAGE TANKS

Capacity, Gallons	Diam	Height
10,000	12' 4"	11' 9"
15,000	15' 0"	11' 9"
20,000	17' 4"	11' 9"
25,000	16' 0"	17' 6"
30,000	17' 4"	17' 6"
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50,000	22' 4"	17' 6"
60,000	24' 4"	24' 3"
75,000	24' 9"	24' 3"
100,000	27' 4"	24' 3"
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1,000,000	77' 0"	29' 0"
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2,000,000	108' 4"	29' 0"

### HORIZONTAL CYLINDRICAL TANKS

Capacity Gallons	Diam	Length
1,000	3' 10"	11' 9"
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2,500	5' 0"	17' 6"
3,000	5' 5"	17' 6"
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5,000	7' 0"	17' 6"
6,000	7' 8"	17' 6"
7,500	7' 6"	24' 3"
8,000	7' 8"	24' 3"
10,000	8' 7"	29' 0"
12,000	8' 7"	34' 9"
15,000	10' 0"	34' 9"
20,000	10' 6"	39' 0"
25,000	10' 6"	39' 0"

TANK FOR PROCTER &  
GAMBLE  
HAMILTON, ONTARIO  
Capacities, 50,000 and 100,  
000 gallons. Heights,  
100 and 50 feet to bottom.



ACID STORAGE TANKS, NIXON NITRATION WORKS,  
NEW BRUNSWICK, N. J.

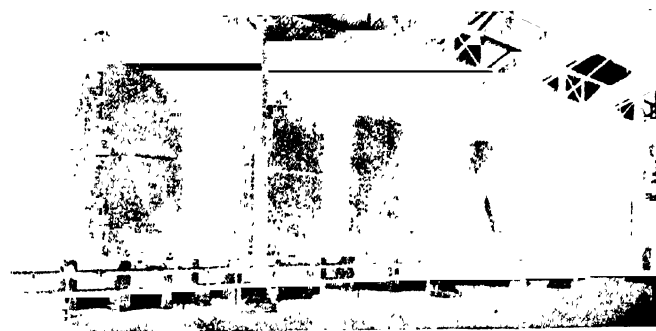
Capacity, 60,000 gallons each. Height, 20 feet to bottom. These  
Tanks are built of heavy plates, and are of sufficient height to load  
tank cars by gravity.

## SPECIFY OUR STANDARDS

We can make more attractive prices and ship more  
promptly when you do so

## CATALOG

Illustrated Catalog No. 66 will be mailed  
from nearest sales office on request.



A BATTERY OF FERMENTATION TANKS, CURTIS BAY DISTILLERY CO.,  
SOUTH BALTIMORE, MD.



TWO MOLASSES TANKS, GREAT WESTERN SUGAR  
CO., GERING, NEB. DIAMETER 35 FEET. HEIGHT  
23 FEET



# CHICAGO PNEUMATIC TOOL COMPANY

CHICAGO PNEUMATIC BUILDING

6 EAST 44TH STREET, NEW YORK, N. Y.



\*Birmingham  
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\*Buffalo  
\*Chicago  
\*Cincinnati  
\*Cleveland

\*Detroit  
El Paso  
Erie  
Franklin  
Houston  
Joplin

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\*New Orleans  
\*New York  
\*Philadelphia  
\*Pittsburgh

Richmond  
Salt Lake City  
San Francisco  
Seattle  
St. Louis  
Basle

\*Berlin  
Bombay  
Brussels  
Buenos Aires  
Christiana  
Copenhagen

\*Fraserburgh  
Havana  
Helsingfors  
Honolulu  
Johannesburg  
London

Manila  
Milan  
Montevideo  
Montreal  
Osaka  
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Sao Paulo  
Seoul  
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Tientsin  
Tokyo  
Toronto  
Vancouver  
Winnipeg

SALES AND SERVICE BRANCHES ALL OVER THE WORLD

## PRODUCTS

Boyer Pneumatic Hammers; Little Giant Pneumatic and Electric Tools; Chicago Pneumatic Air and Gas Compressors; Vacuum Pumps; Pneumatic hoists; Giant Oil and Gas Engines; Rock Drills; Coal Drills.

## CHICAGO PNEUMATIC COMPRESSORS

Chicago Pneumatic Air and Gas Compressors are built in 500 distinct sizes and types, a fact which emphasizes the Company's ability to supply an air power plant of correct design and proportion regardless of capacity required or operating conditions. Standard sizes are built for steam, belt, electric, motor, oil, gas or gasoline engine drive and in single, duplex and duplex-tandem types.

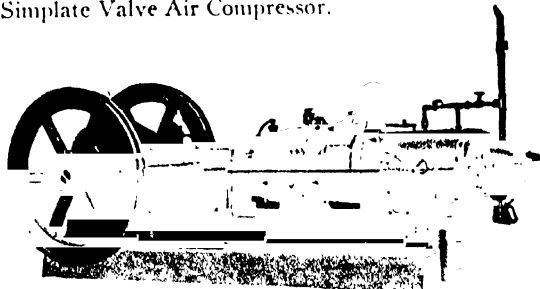


CHICAGO PNEUMATIC TWO-STAGE  
DIRECT CONNECTED MOTOR DRIVEN  
COMPRESSOR, CLASS O-CE

**C-P Duplex Air Compressors—**  
**Class O,** are steam, belt and motor driven. They meet every requirement of manufacturing plants. Built in medium and large capacities. Large belt driven and direct mounted motor driven compressors are essentially constant speed machines. Therefore, these compressors are furnished with a variable volume control, by means of which the compressors operate at full, half and no load with maximum economy. Ask for Bulletin 400.

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**Chicago Pneumatic Oil Driven Air Compressors—**  
These compressors combine in one unit the highly perfected Giant Oil Engine and the Chicago Pneumatic Simplate Valve Air Compressor.



CHICAGO PNEUMATIC OIL DRIVEN AIR COMPRESSOR

Simplicity of operation and ability to use cheap fuels economically and the absence of stand-by losses are further distinct advantages. Built in a variety of sizes. They operate successfully on oils of 28° Baumé scale up to and including kerosene.

The net cost of operation of these machines is frequently less than 50 per cent. of that of an equivalent steam unit. Tank mounted, stationary, or skid-mounted units are available. All operate successfully on low grade fuel oils even under widely different climatic conditions. Ask for Bulletin 607.

The same style units, both portable and stationary, are built for operation on gas and gasoline. Ask for Bulletin 34-Y.

## FUEL OIL, GAS AND GASOLINE DRIVEN COMPRESSORS

Class N SO 2 Fuel Oil Driven, Stationary Type

Piston Displacement cu. ft.	R P M	Maximum H P	Floor Space ft. in.	Code Word
144	125	21	11-9 x3-5	AVARACCIO
212	125	29	13-6 x3-8	AVARAN
309	300	17	15-4 x4-7	AVARE
370	250	57	18-3 x5-7	AVARETTO
507	210	77	21-6 x6-0	AVARGOR
654	230	102	21-10x6-0	AZADONES

**Class N Compressors—**Built in single-stage, steam and belt driven types.

Where the demand for air is very intermittent, these compressors can be furnished with motors controlled by automatic starters and pressure regulators, the function of which is to shut down the motor when the pressure in the air receiver reaches the predetermined maximum, and to start the motor when the air reaches the predetermined minimum. This results in a considerable saving of power.



CHICAGO PNEUMATIC SHORT-BELT MOTOR  
DRIVEN AIR COMPRESSOR, CLASS N-BBE

Air Cylinder		R P M	Piston Displacement cu. ft.	Air Pressure lb.	H P * Required	Code Words	
Diam. in.	Stroke in.					Steam Driven Type†	Belted Type
6	6	350	69	80-125	9-11	NABREL	NABABDOM
7 1/2	6	350	107	50-100	13-17	NABDICK	NABACRID
8	8	300	130	80-125	21-26	NASENNA	NABADORA
9	8	300	176	70-100	24-30	NESEPTOR	NEBAEGGER
10	8	300	218	40-70	24-31	NESEPTO	NEBAFFLING
12	8	300	314	15-40	20-34	NEGRIP	NEBAGOT
10	10	275	250	80-125	39-48	NESHOIE	NEBAHIA
12	10	275	360	50-100	45-62	NESMULE	NIBAHJEN
15	10	275	562	30-50	53-79	NISLAK	NIBAHON
17	10	275	723	15-30	45-68	NISMURK	NIBAKLET
12	12	250	392	80-125	63-78	NOSNACCO	NIBALENA
14	12	250	534	50-100	70-94	NOSOMULA	NOBAMPO
17	12	250	788	30-50	76-103	NOSOSTRIS	NOBANDIS
20	12	250	1092	15-30	65-107	NOSPARRY	NOBALIA
14	14	220	549	80-125	96-123	NOSQUAN	NOBAPTIST
17	14	220	809	40-80	100-141	NUSRAID	NOBAQUA
20	14	220	1120	15-40	75-135		NUBARON

\*For belt driven compressors, this includes belt loss; for steam driven compressors, the figures stated are the I.H.P. (indicated horsepower) in the steam cylinder

Continued on Next Page



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HAMILTON, ONTARIO  
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100 and 50 feet to bottom.



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NEW BRUNSWICK, N. J.

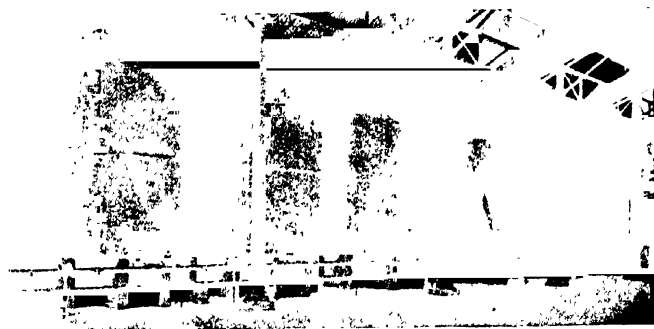
Capacity, 60,000 gallons each. Height, 20 feet to bottom. These Tanks are built of heavy plates, and are of sufficient height to load tank cars by gravity.

## SPECIFY OUR STANDARDS

We can make more attractive prices and ship more promptly when you do so

## CATALOG

Illustrated Catalog No. 66 will be mailed from nearest sales office on request.



A BATTERY OF FERMENTATION TANKS, CURTIS BAY DISTILLERY CO.,  
SOUTH BALTIMORE, MD.



TWO MOLASSES TANKS, GREAT WESTERN SUGAR  
CO., GERING, NEB. DIAMETER 35 FEET. HEIGHT  
23 FEET

## \*STANDARD TYPE BOYER RIVETING HAMMERS

Size and Style	Piston Diam. in.	Length Stroke in.	Capacity (Rivets) in.	Weight		Code Word
				Net lb.	Ship lb.	
50	1 1/4	5	3/4	20	24	ABACONICAL
60	1 1/4	6	7/8	23	29	ABACIST
80	1 1/4	8	1 1/4	25	32	ABACOT
90	1 1/4	9	1 1/4	26	33	ABACTOR
80x	1 1/4	8	1 1/4	24 1/2	32	ABACEPS

## \*HEAVY TYPE BOYER RIVETING HAMMERS

Size	Piston Diam. in.	Length Stroke in.	Capacity (Rivets) in.	Weight Net lb.	Weight Ship lb.	Code Word
60	1 1/4	6	7/8	26	31	ABACISTER
80	1 1/4	8	1 1/4	28	35	ABACOTEM
90	1 1/4	9	1 1/4	29	36	ABACTUS

## \*TYPE H BOYER RIVETING HAMMERS

Size	Piston Diam. in.	Length Stroke in.	Capacity (Rivets) in.	Weight Net lb.	Weight Ship lb.	Code Word
H 4	1 1/4	3	3/4	12 1/2	15 1/2	ABABSON
H 4	1 1/4	4	3/4	12 1/2	16	ABABSTER

Note: Equipment with any of the foregoing hammers includes hose nipple and spring clip for holding rivet sets. Rivet sets furnished at extra charge when ordered.

If desired any Boyer Standard or Heavy Type riveting hammer can be furnished with a closed handle having either inside or outside trigger instead of standard open type handle shown, at no additional charge. An inverted handle, instead of Standard Handle, can be furnished at an additional charge.

## BOYER AND KELLER CALKING AND CHIPPING HAMMERS

Made in a complete range of sizes. Useful in every shop having compressed air, for chipping gray iron and steel castings and alloy steel ingots, calking seams, trimming flush head rivets, beading flues, etc. These are only a few of the jobs which can be performed at greater speed with less effort by the use of these tools. Ask for Bulletin 600.

## BOYER "BK" TYPE CHIPPING AND CALKING HAMMER

## \*BOYER "BK" CHIPPING AND CALKING HAMMERS

Size and Style	Piston Diam. in.	Length Stroke in.	Service for Which Adapted	Weight		Code	
				Net lb.	Ship lb.	Round	Hexagon
1	1 1/4	1	Light chipping	11 1/2	14	ABHME	ABHURL
1x	1 1/4	1 1/2	Med. chipping	12 1/2	16	ABHABIC	ABHABITION
2	1 1/4	2	Gen. chipping	14	18	ABHADM	ABHABITION
3	1 1/4	3	Hvy. chipping	14 1/2	18	ABHAIL	ABHABITION
4	1 1/4	4	Ex. hvy. chipping	15 1/2	21	ABHOLGY	ABHABITION

## \*BOYER CHIPPING, CALKING AND SCALING HAMMERS

Size	Piston Diam. in.	Length Stroke in.	Service for Which Adapted	Weight Net lb.	Weight Ship lb.	Code
F	1 1/4	1 1/4	Seal hammer	6 1/2	10	ABECTION
BB	1 1/4	1 1/2	Flue beading	9	13	ABDOMEN
B	1 1/4	2	Light chipping	12	16	ABDIQUER

## \*KELLER CHIPPING, CALKING AND SCALING HAMMERS

Size	Piston Diam. in.	Length Stroke in.	Service for Which Adapted	Weight Net lb.	Weight Ship lb.	Code
0	3/4	1 1/4	Seal hammer	6	10	ABED
1	1 1/4	1 1/2	Seal hammer	8	12	ACBELRIC
1x	1 1/4	1	Light chipping	12	15	ABENSUR
1x	1 1/4	1 1/2	Med. chipping	14	18	ABERRANCE
2	1 1/4	2	Gen. chipping	14 1/2	18	ABERRATION
3	1 1/4	3	Hvy. chipping	15	19	ABETTING
4	1 1/4	4	Ex. hvy. chipping	16	22	ABEYANTLY

\*When ordering, specify "Round" or "Hexagon" bushings. Chisels furnished at extra charge.

†In ordering, specify whether heavy or light type handle is desired. The heavy type is standard. ‡Valveless.

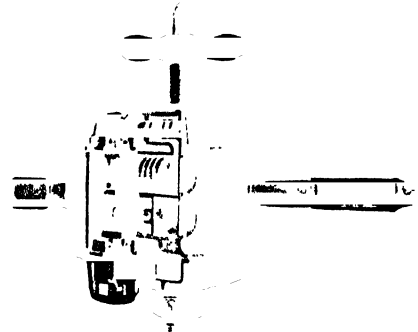
## "LITTLE GIANT" AIR DRILLS

For countless drilling, reaming, tapping, nut and bolt tightening, screw setting, flue-rolling and countersinking operations, no portable drilling machine yet devised has excelled the flexibility of "Little Giant" portable air drills. Built in a wide variety of types and sizes.

Features of design: Three-point ball-bearing crankshaft suspension. Three-unit housing. Stub-tooth gears, stronger and more compact than the involute type. Balanced piston valves, long-wearing and leakproof.

More than 125,000 "Little Giant" air drills are in successful use. They are preferred for portable work

in shops; for heavy work and rough handling in shipyards, railway shops, boiler works, etc. Drilling up to 3 in. in steel, countersinking, reaming, tapping and flue rolling are rapidly accomplished with "Little Giants." Overloading does not affect them. Piece workers prefer "Little Giants" because they increase output and earnings.



## CUTAWAY VIEW, NO. 2 "LITTLE GIANT" AIR DRILL

Made in reversible and non-reversible models, with different drilling speeds ranging from 50 to 2200 r.p.m.; with Square or Morse taper shank, and with feed-screw, grip handle or breast plate equipment. Ask for Bulletin 598.

## "LITTLE GIANT" AIR DRILLS

Size and Style	Speed Light, r.p.m.	Air Used, cu. ft. per min.	Capacity*	Weight Net lb.	Code
			Drill in. Ream Tap Flue Roll		
10-F	2200	11	1/4	8	ABOBELLA
10-S	1000	7	1/4	8 1/2	ABOBESTIC
3-S	(1) 1800	15	1/2	11 1/2	ABOCADIC
3-RS	(1) 1900	15	1/2	11 1/2	ABORINFEET
3-A	(2) 800	15	1/2	12	ABOMASTER
4	(2) 800	20	3/4	22	ABOCAFE
4R	(2) 300	18	3/4	24	ABOBAND
4T	(2) 370	18	3/4	24	ABOBLEATH
4C	(2) 210	20	1 1/4	28	ABOBROOM
4RC	(2) 125	18	1 1/4	30	ABOBRTISH
4TC	(2) 130	18	1 1/4	30	ABORIDE
2	(2) 190	25	1 1/4	40	ABOCALIA
2R	(2) 325	20	1 1/4	42	ABOCABRA
12	325	20	1 1/4	44	ABOCABLING
20	(2) 155	25	1 1/2	52	ABOCALYX
2RC	(2) 120	20	1 1/2	54	ABOCASTER
12C	(2) 130	20	1 1/2	56	ABOCANTON
1	(2) 400	35	2	58	ABOCENTRIC
1R	(2) 230	30	2	60	ABOCERVIX
11	230	40	2	60	ABOCERVIX
15	(2) 260	35	2 1/4	65	ABOCERVIX
15R	(2) 180	30	2 1/4	68	ABOCEDILLA
15T	180	30	2 1/4	68	ABOCEDILLA
1C	(2) 110	35	3	75	ABOCERFAL
1RC	(2) 65	30	3	78	ABOCERFAL
11C	58	30	3	78	ABOCERFAL
15C	(2) 80	35	3 1/4	83	ABOCIBALD
15RC	(2) 52	30	3 1/4	87	ABOCIBALD
15TC	50	30	3 1/4	97	ABOCIGRAND

## "LITTLE GIANT" CLOSE QUARTERS AIR DRILLS

Size	Speed Light, r.p.m.	Air Used, cu. ft. per min.	Capacity*	Weight Net lb.	Code
51	(3) 310	25	1 1/4	44	ABORIDEX
91	(3) 180	35	1 1/4	68	ABORIKON
81R	(3) 240	25	1 1/4	68	ABORIDEX
91R	(3) 120	35	1 1/4	68	ABORIKONISM
3	400	20	2 1/4	20	ABOREZOR

## "LITTLE GIANT" WOOD BORING MACHINES

Size	Speed Light, r.p.m.	Air Used, cu. ft. per min.	Capacity*	Weight Net lb.	Code
10S	(4) 1000	7	3/4	8	ABORCATE
3RS	(4) 1200	15	1	11 1/2	ABOREXIS
3R8S	(4) 600	15	1	11 1/2	ABORCATE
5	(5) 650	18	2	24	ABORCATE
5S	(5) 370	18	2 1/4	24	ABORCATE
14	(5) 700	20	4	32	ABORILET
14S	(5) 325	20	4 1/4	32	ABOROMA

\*Nos. 00 and 0 indicate chuck sizes; other numbers indicate Morse taper sockets.

†Nos. in parentheses indicate the following regular equipment: (1) Breast plate and No. 0 chuck (2) Feed screw, (3) Ratchet wrench for feed screw, (4) Grip handle and wood bit chuck, (5) Wood bit chuck.

‡Adapted for special extra heavy reaming and tapping.

§Letter "R" indicates reversible type drills; letter "C" indicates compound geared drills; letter "T" indicates drills fitted with grip handles and especially adapted for tapping or flue rolling.

¶Drilling capacities are for drilling in metal except wood boring machines, for which capacity in soft dry pine is given.

||Nos. 10-F to 3-A inclusive, and No. 8 have 3/4-in. hose connections;

Nos. 4 to 91-R inclusive have 1/2-in. hose connections.

†At 80 lb. pressure.

Continued on Next Page

### "LITTLE GIANT" WOOD BORING MACHINES

By gearing up "Little Giant" air drills to the proper speed, fitting them with suitable chucks and grip handles which control the reversing mechanism, a complete line of wood boring machines is available in capacities up to 4 in. in pine. They embody minimum weight in a reversible machine which will handle standard wood boring bits. May be reversed instantly and withdrawn while running at full speed. Also used for screwing in and tightening nuts and bolts. "Little Giant" wood boring machines prove useful wherever compressed air and wood boring exist together. Ask for Bulletin 598.

### "LITTLE GIANT" PNEUMATIC GRINDERS

"Little Giant" grinders are adaptations of the smaller sizes of "Little Giant" air drills. Grinding wheel is

NO. 5  
"LITTLE  
GIANT"  
WOOD BOR-  
ING MACHINE



NO. 3 "LITTLE GIANT" GRINDER

For general grinding and heavy work. Air enters handle. Trigger in grip handle, relieves operator and makes the grinder easy to handle mounted on extension of crankshaft. Four sizes. Ask for Bulletin 598.

### "LITTLE GIANT" AIR MOTORS, WINCHES AND GEARED HOISTS

All "Little Giant" air winches and hoists are operated by a simple and reliable air motor. This motor has two double acting oscillating cylinders. Oscillation of cylinders opens and closes the ports—no other valve gear is necessary. Great power is obtained through a high speed motor 240 to 1100 r.p.m. Motor is reversible, easily controlled, has automatic lubrication and is of very rugged construction throughout.



SIZE NO. 12 "LITTLE GIANT"  
TWO-STRAND, THREE-TON  
PORTABLE GEARED AIR HOIST  
Showing limit stop and chain control.

**Pneumatic Portable Geared Hoists**—Made in capacities from 1 to 10 tons. Motor is controlled by chains from floor, or by remote control as desired. Safety is assured by an automatic air brake which holds the "LITTLE GIANT" PORTABLE GEARED AIR HOISTS

Size	Capacity (Tons)	Height of Lift ft.	Lifting Speed (per Min.) ft.	Min. Distance Between Hooks in.	Air Consumption Per Ft. Lift cu ft.	Net Weight lb.	Code
10	1	9	28	39	3	355	ACCRESCENT
11	2	9	16	39	4	360	ACCRETION
12	3	11	10	45	8	465	ACCROACH
13	5	12	7	53 1/2	15	820	ACCROIRE
14	10	12	4	61 1/2	27	1080	ACCURUE

NOTE. When desired, "Little Giant" portable geared hoists can be supplied in any of the above sizes, except size 10, equipped with either a plain trolley, geared single track trolley, or a geared double track trolley. When ordering, always state size and weight of channels on which trolley must operate.

load at any desired point. A simple limit stop provides absolute protection against overhoisting. When desired, these hoists will be furnished with plain single track trolley, geared single or geared double track trolley. For full details ask for Bulletin 599.

### "LITTLE GIANT" PORTABLE ELECTRIC DRILLS

Built with direct, alternating or "Universal" current motors in several sizes and types. Have ball bearings, stub tooth gears, ample ventilating and cooling systems, and high overload capacity without undue temperature rise. Controlled by patented non-arcing handle switch.

"Little Giant" electric drills are light in weight, easily portable. Taking the drill to the work saves carrying parts to drill presses, saves setting-up time, and expensive machine tool operations. Universally used in machine shops, garages, and also in largest manufacturing operations. Thousands are profitably used in the Ford Plants, where scientific minimum cost production is most highly developed. Frequently a small investment in "Little Giants" will produce a material increase in output per day. D. C. type drills are described in Bulletin 581; and "Universal" types in Bulletin 616.

These tools are built also in semi-portable type for drilling and reaming track joint holes. Such outfits, now in wide use by electric and steam railways, are 10 to 12 faster and 90 per cent cheaper than old-time hand methods. Ask for Bulletin E-60.

### "LITTLE GIANT" ELECTRIC GRINDERS

Same general construction as "Little Giant" electric drills, but fitted with arbors for carrying abrasive wheels. Built in portable, tool-post and precision-grinding types. Foundries, machine shops, railways and metal manufacturing plants can use these tools for many labor-conserving purposes. Ask for Bulletin E-61.

### "LITTLE GIANT" ELECTRIC DRILLS—DRILLING CAPACITIES IN METAL

Size	*Universal for 110 and 220 Volt in.	D.C. for 120 and 240 Volt in.	**A.C. for 2 Phase and 3 Phase in.	D.C. for Street Ry. Work, 600 Volt in.
000	3/8	---	---	---
000x	1/4	---	---	---
00 B	1/8	---	---	---
0 B	1/8	5/16	3/8	---
1 B	1/2	1/2	1/2	1/2
1 1/2 B	3/4	3/4	3/4	3/4
2 B	7/8	7/8	7/8	7/8
3 B	1 1/4	1 1/4	1 1/4	1
4 B	---	2	2	1 1/2

\*For connection to ordinary lamp socket. D.C. or A.C. of 60 cycles or less, single-phase, interchangeably.

\*\*Furnished in side spindle style only. Standard windings are for 60 cycles, 120 or 240 volts. Nos. 2, 3 and 4 can be wound for 380 or 440 volts.

NOTE. In ordering specify Size No.; also whether D.C., A.C. or "Universal" type is desired. (If A.C., specify phase.)

# L. R. CHRISTIE COMPANY

Manufacturers of  
Dryers, Calciners, Roasters and Coolers  
501 Peoples Bank Building  
PITTSBURGH, PA.

## PRODUCTS

Rotary Dryers, Calciners, Roasters and Coolers.

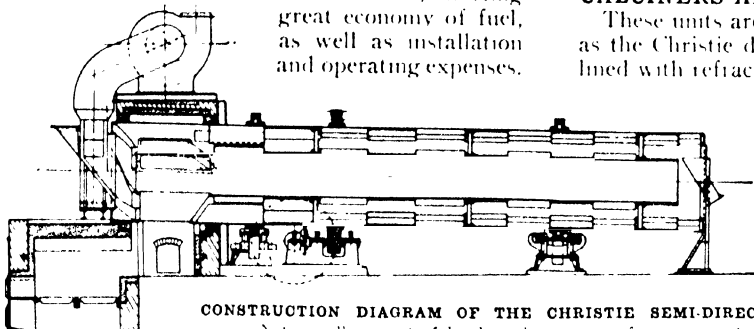
Also manufacturers of Rotary Continuous Retorts.

## TYPES OF DRYERS

The L. R. Christie Company manufactures every type of rotary dryer. Certain types have been improved and perfected to the very highest degree of efficiency. Chief among these are the semi-direct heat dryer, the indirect heat dryer, the indirect steam heat dryer and the direct heat dryer.

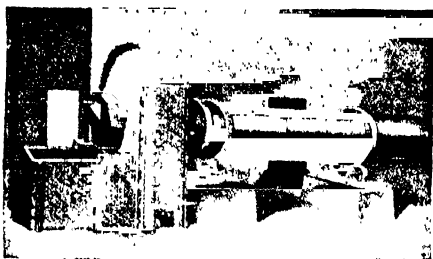
### SEMI-DIRECT HEAT DRYER

An internal heat flue type having a central flue through which the gases first pass, giving up their heat to the surrounding material and later passing directly through material in counter direction, effecting great economy of fuel, as well as installation and operating expenses.



CONSTRUCTION DIAGRAM OF THE CHRISTIE SEMI-DIRECT HEAT DRYER

Note: small amount of brick work necessary for permanent installation.  
A continuous dryer perfected by Christie



SEMI-DIRECT HEAT DRYER

### INDIRECT HEAT DRYER

In this dryer, the hot gases are not permitted to come in contact with the material. The heat is applied directly to the outer cylinder as it rotates and returns through a flue in center of drying compartment.

As all joints are closed, no dust collector is needed, even though materials are very finely divided.

This dryer is substantially a rotary retort. Its true economy is evidenced by the remarkably low temperatures at exhaust.

### DIRECT HEAT DRYER

A single shell, direct fired cylinder for rough work. Furnace at feed or discharge according to materials being dried.

**CHRISTIE**  
DRYERS · CALCINERS · COOLERS

### STEAM HEATED DRYER

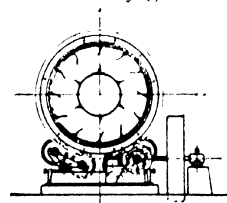
Frequently in drying certain materials a high temperature has been found injurious. To offset such a possibility and maintain an even low heat, steam may be used as a heat medium, applied either through an internal coil or by air heated in an external coil.



DRYER USING INDIRECT STEAM HEAT

### CALCINERS AND ROASTERS

These units are of practically the same construction as the Christie direct heat dryers. A rotary cylinder lined with refractory brick is heated by gases directly



applied to material. Exceedingly high temperatures are secured, moisture driven off, foreign matter burned out and chemical reactions obtained.

### SERVICES

In order that the L. R. Christie Company may be of maximum service in the solution of drying problems, the following details should be kept in mind when writing for information:

Character of material to be dried.

Capacity in dry tons of 2000 lbs. per hour.

Initial and final percentage of moisture. Is moisture free or combined? If combined, at what temperature is it driven off?

Temperature which material will stand without injury.

Fineness (mesh) of materials.

Are materials injured by direct contact with furnace gases?

Is waste heat available? Temperature. Quantity.

Fuel to be used: coal, oil, gas or waste heat.

Twenty-one years of specialized effort in designing and operating drying and cooling machinery have been responsible for these advanced models. They are not untried experiments. Their marked economy, made possible through many improvements over old types of dryers, recommends them immediately to the discriminating buyer.

---

# GEO. L. CLAFLIN COMPANY

Established 1873

Scientific and Hospital Supplies

70 SO. MAIN STREET, PROVIDENCE, R. I.

Branch at Attleboro, Mass

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## SPECIALTIES

Autoclaves  
Balances, Analytical, Assay, etc.  
Blowers, Foot and Power  
Bottles  
Calorimeters  
Centrifuges, Hand and Electric  
Chemicals and Reagents  
Colorimeters  
Delineascopes  
Drying Ovens, Gas and Electric  
Enamel Ware  
Filter Paper, American and Imported  
Furnaces, Electric, Oil, and Gas  
Hospital Furniture and Equipment  
Incubators  
Jewelers' and Mill Supplies  
    Belting and Buffs  
    Chemicals and Acids  
    Electroplating Apparatus  
    Stoneware  
    Tool Steel  
Laboratory Glassware  
Microscopes and Accessories  
Milk Testing Apparatus  
Mortars and Pestles  
Oil Testing Apparatus  
Paints, Oils and Varnishes  
Platinum Ware  
Porcelain, Casseroles, Crucibles, Dishes, etc.  
Rubber, Stoppers and Tubing, Aprons and Gloves  
Silica Ware  
Sterilizers, Gas and Electric  
Stillls  
Surgical Instruments  
Thermometers and Hydrometers  
Water Baths

## DEPARTMENTS

Laboratory Apparatus and Reagents  
Hospital and Physicians' Equipment  
Jewelers' Appliances and Chemicals  
Retail Drugs and Sundries  
Wholesale: Druggists' Supplies  
Manufacturing: Pharmaceuticals and Soda Syrups

## NEW ENGLAND HEADQUARTERS

Laboratory Apparatus and Chemicals  
Scientific and Hospital Supplies  
Walrus Soda Fountains  
Drug Store Fixtures  
Ansco Photographic Supplies  
Bacteriological Stains  
Rare Organic Chemicals  
C. P. Reagents

## STOCK

We carry at all times a large stock of supplies for  
Industrial and Educational Laboratories.

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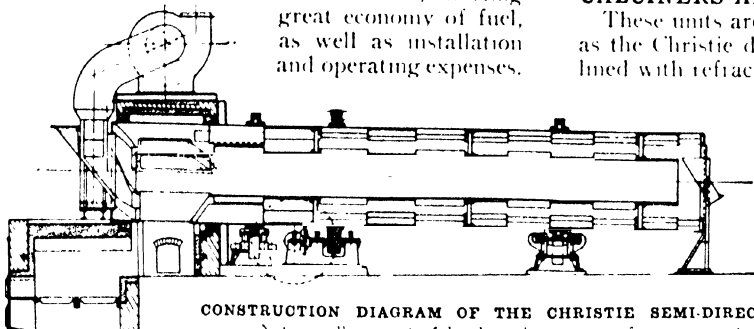
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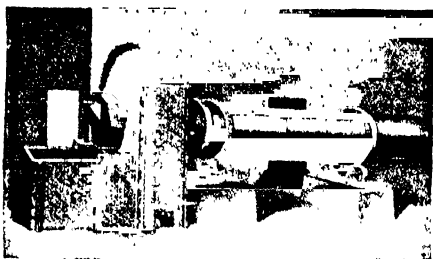
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**CHRISTIE**  
DRYERS · CALCINERS · COOLERS

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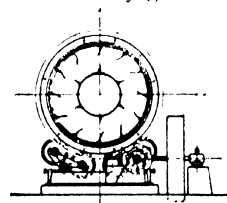
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Established 1874

# JAMES B. CLOW & SONS

Manufacturers of Cast Iron Pipe, Plumbing and Heating Supplies,  
Cast Iron Columns

534-536 South Franklin Street

CHICAGO, ILL.

Telephone  
ABASH 27-9

New York, N. Y.  
Louis, Mo.

Milwaukee, Wis.  
Pittsburgh, Pa.

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SALES OFFICES  
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Detroit, Mich.

Philadelphia, Pa.  
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WORKS  
Newcomerstown, Ohio

Coshocton, Ohio

## PRODUCTS

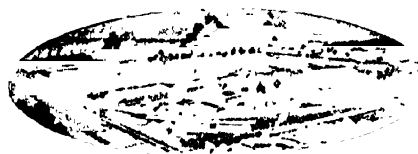
Cast Iron Pipe and Fittings—Hub and Spigot,  
flanged or threaded joints.  
Special Castings for Chemical Companies.  
Plumbing and Heating Supplies.  
Water Works and Steam Supplies.  
Marble Products.  
Ultraviolet Ray Sterilizers.  
"Gasteam" Radiators.

## FACILITIES

Our two plants shown below produce all sizes of cast iron pipe 1½ inch to 48 inch. They are also equipped to handle any type of casting required by the Chemical trades.



CLOW PLANT, COSHOCTON, OHIO



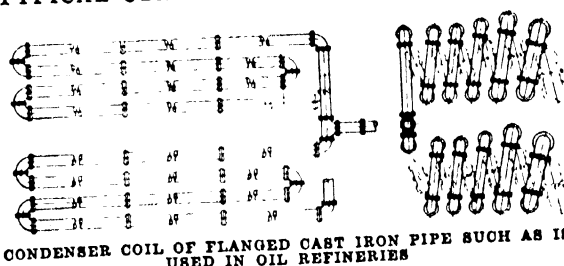
CLOW PLANT, NEWCOMERSTOWN, OHIO



## SPECIAL CASTINGS

We are prepared to furnish special castings from your plans and specifications. Our Engineering Department will gladly assist you in designing if desired.

## TYPICAL USES FOR CAST IRON PIPE



CONDENSER COIL OF FLANGED CAST IRON PIPE SUCH AS IS USED IN OIL REFINERIES



CAST IRON PIPE USED BY CALUMET AND HECLA MINING CO. TO CONVEY MILL TAILINGS

Wherever abrasive metals are to be conveyed—Cast Iron Pipe can be used



ILLUSTRATING USES OF CAST IRON PIPE IN BY-PRODUCT COKE OVEN INSTALLATION.

The piping in such installations is subject to corrosive action of gases and fumes and Cast Iron Pipe is used exclusively

## OTHER USES OF CAST IRON PIPE

Wherever pipe or fittings are subject to corrosion, cast iron should be used. For handling gases, coal, tar, oils, naphtha, benzol, ammonia, sulphuric or other acid, fresh or salt water, cast iron is recommended.

## CATALOGS

Complete Catalogs gladly sent on request. The following will aid in the selection of the catalog suited to the requirements:

- Plumbing, Catalog "M."
- Drinking Fountains, Fountain Catalog.
- Heating, Special Catalog.
- Cast Iron Pipe, Fittings and Foundry Products—Pipe Economy.
- Steam and Water Works Supplies, Catalog "A."
- Water Sterilization, R.U.V. Catalog.

# L. R. CHRISTIE COMPANY

Manufacturers of

Dryers, Calciners, Roasters and Coolers

501 Peoples Bank Building

PITTSBURGH, PA.

## PRODUCTS

Rotary Dryers, Calciners, Roasters and Coolers.

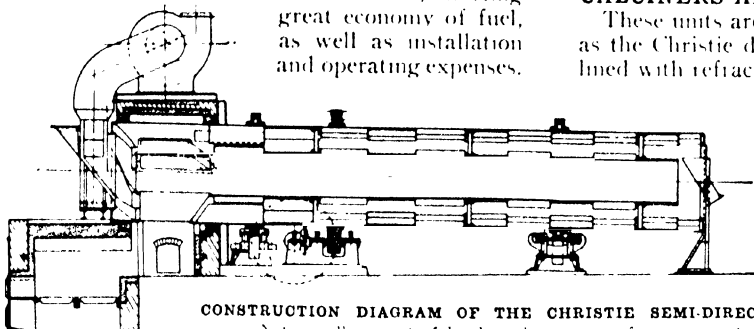
Also manufacturers of Rotary Continuous Retorts.

## TYPES OF DRYERS

The L. R. Christie Company manufactures every type of rotary dryer. Certain types have been improved and perfected to the very highest degree of efficiency. Chief among these are the semi-direct heat dryer, the indirect heat dryer, the indirect steam heat dryer and the direct heat dryer.

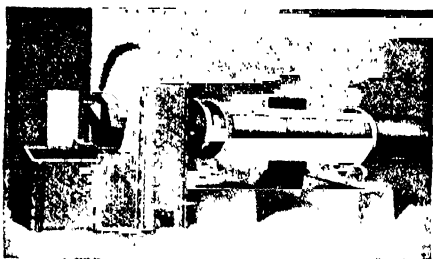
### SEMI-DIRECT HEAT DRYER

An internal heat flue type having a central flue through which the gases first pass, giving up their heat to the surrounding material and later passing directly through material in counter direction, effecting great economy of fuel, as well as installation and operating expenses.



CONSTRUCTION DIAGRAM OF THE CHRISTIE SEMI-DIRECT HEAT DRYER

Note: small amount of brick work necessary for permanent installation.  
A continuous dryer perfected by Christie



SEMI-DIRECT HEAT DRYER

### INDIRECT HEAT DRYER

In this dryer, the hot gases are not permitted to come in contact with the material. The heat is applied directly to the outer cylinder as it rotates and returns through a flue in center of drying compartment.

As all joints are closed, no dust collector is needed, even though materials are very finely divided.

This dryer is substantially a rotary retort. Its true economy is evidenced by the remarkably low temperatures at exhaust.

### DIRECT HEAT DRYER

A single shell, direct fired cylinder for rough work. Furnace at feed or discharge according to materials being dried.

**CHRISTIE**  
DRYERS · CALCINERS · COOLERS

### STEAM HEATED DRYER

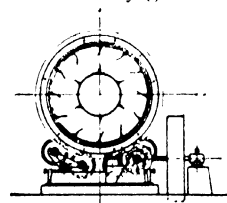
Frequently in drying certain materials a high temperature has been found injurious. To offset such a possibility and maintain an even low heat, steam may be used as a heat medium, applied either through an internal coil or by air heated in an external coil.



DRYER USING INDIRECT STEAM HEAT

### CALCINERS AND ROASTERS

These units are of practically the same construction as the Christie direct heat dryers. A rotary cylinder lined with refractory brick is heated by gases directly



applied to material. Exceedingly high temperatures are secured, moisture driven off, foreign matter burned out and chemical reactions obtained.

### SERVICES

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Character of material to be dried.

Capacity in dry tons of 2000 lbs. per hour.

Initial and final percentage of moisture. Is moisture free or combined? If combined, at what temperature is it driven off?

Temperature which material will stand without injury.

Fineness (mesh) of materials.

Are materials injured by direct contact with furnace gases?

Is waste heat available? Temperature. Quantity.

Fuel to be used: coal, oil, gas or waste heat.

Twenty-one years of specialized effort in designing and operating drying and cooling machinery have been responsible for these advanced models. They are not untried experiments. Their marked economy, made possible through many improvements over old types of dryers, recommends them immediately to the discriminating buyer.



Established 1874

# JAMES B. CLOW & SONS

Manufacturers of Cast Iron Pipe, Plumbing and Heating Supplies,  
Cast Iron Columns

534-536 South Franklin Street

CHICAGO, ILL.

Telephone  
ABASH 27-9

New York, N. Y.  
Louis, Mo.

Milwaukee, Wis.  
Pittsburgh, Pa.

Denver, Colo.

SALES OFFICES  
San Francisco, Calif.  
Minneapolis, Minn.  
Tampa, Fla.

Omaha, Nebr.  
Detroit, Mich.

Philadelphia, Pa.  
Kansas City, Mo.

Chicago, Ill.

WORKS  
Newcomerstown, Ohio

Coshocton, Ohio

## PRODUCTS

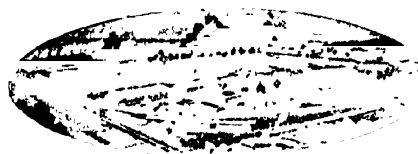
Cast Iron Pipe and Fittings—Hub and Spigot,  
flanged or threaded joints.  
Special Castings for Chemical Companies.  
Plumbing and Heating Supplies.  
Water Works and Steam Supplies.  
Marble Products.  
Ultraviolet Ray Sterilizers.  
"Gasteam" Radiators.

## FACILITIES

Our two plants shown below produce all sizes of cast iron pipe 1½ inch to 48 inch. They are also equipped to handle any type of casting required by the Chemical trades.



CLOW PLANT, COSHOCTON, OHIO



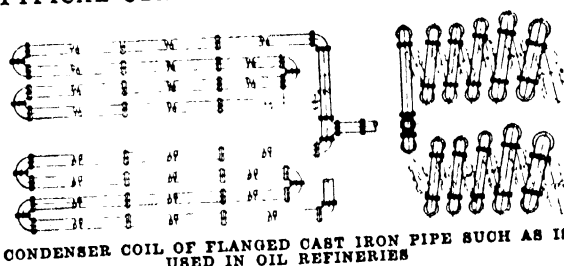
CLOW PLANT, NEWCOMERSTOWN, OHIO



## SPECIAL CASTINGS

We are prepared to furnish special castings from your plans and specifications. Our Engineering Department will gladly assist you in designing if desired.

## TYPICAL USES FOR CAST IRON PIPE



CONDENSER COIL OF FLANGED CAST IRON PIPE SUCH AS IS USED IN OIL REFINERIES



CAST IRON PIPE USED BY CALUMET AND HECLA MINING CO. TO CONVEY MILL TAILINGS

Wherever abrasive metals are to be conveyed—Cast Iron Pipe can be used



ILLUSTRATING USES OF CAST IRON PIPE IN BY-PRODUCT COKE OVEN INSTALLATION

The piping in such installations is subject to corrosive action of gases and fumes and Cast Iron Pipe is used exclusively

## OTHER USES OF CAST IRON PIPE

Wherever pipe or fittings are subject to corrosion, cast iron should be used. For handling gases, coal, tar, oils, naphtha, benzol, ammonia, sulphuric or other acid, fresh or salt water, cast iron is recommended.

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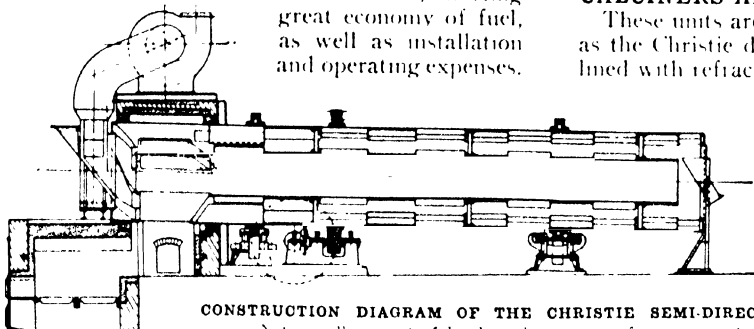
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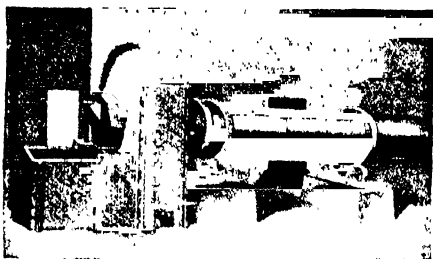
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A continuous dryer perfected by Christie



SEMI-DIRECT HEAT DRYER

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DRYERS · CALCINERS · COOLERS

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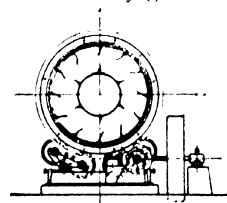
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# CONSOLIDATED PRODUCTS COMPANY

INCORPORATED

Cable Address  
EQUIPMENT, New York  
Telephone  
CORTLANDT 7506 7507  
WAREHOUSE  
Jersey City, N. J.

Machinery, Tanks, Equipment  
38 PARK ROW, NEW YORK, N. Y.



## PRODUCTS

Autoclaves	Rotary Dryers	Mills
Acid Eggs	Steam Engines	Mixers
Boilers	Gas and Oil Engines	Machine Tools
Blowers	Evaporators	Nitrators
Centrifugals	Filter Presses	Pumps
Compressors	Generators	Pans
Condensers	Grinders	Still
Crushers	Kettles	Stacks
Shelf Dryers	Motors	Sulphonators
Drum Dryers		Sulphur Burners
		Tanks

## SERVICE

Our service in furnishing good new and used equipment is being used by many large concerns.

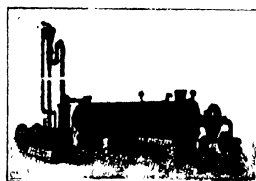
You can depend on our specifications and the excellent working condition of our equipment.

Our stock consists of a large number of standard equipments, and we are able to make immediate shipment.

You can make a considerable saving by purchasing from us. We are always in the market for equipment, and are interested in any idle equipment you may have. You will be interested in our engineering service applied to used equipment. It will save your time.

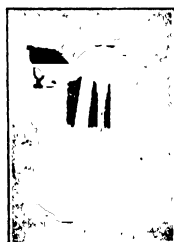
Your inquiries are solicited.

## EQUIPMENT



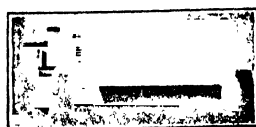
ROTARY DRYER

For their various particular purposes we have atmospheric and vacuum rotary drum dryers, rotary vacuum dryers, and direct and indirect fire rotary dryers.



CENTRIFUGAL

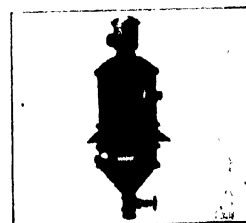
Centrifugal machines embrace both overdriven and underdriven types, bottom and top discharge, furnished with steel, copper, bronze, or rubberized baskets.



GRINDER

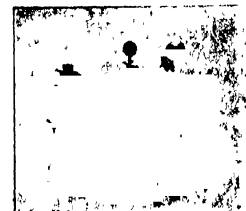
Grinding and crushing machinery of all types, tube, ball, and attrition mills, crushers and energy ring roll mills, disintegrators, burr stone mills, roller mills, etc.

Evaporators are furnished in various types, both single and multiple effect. The construction is of cast iron, steel, copper or bronze according to requirements.



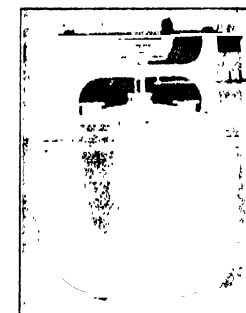
EVAPORATOR

Shelf Dryers of both vacuum and atmospheric types in various sizes. Also truck type dryers. Capacities range from laboratory sizes to the largest standard type made.



SHELF DRYER

Kettles, both plain and jacketed, for various purposes, such as reducing, nitrating, sulphonating, boiling, distilling, mixing. The construction being in accordance with the requirements.



KETTLE  
Nitrator or Sulphonator

Filters in plate and frame, clam shell, rotary, and tank types in various sizes.



FILTER PRESS

Tanks of both steel and wood up to 55,000 barrels.



TANK

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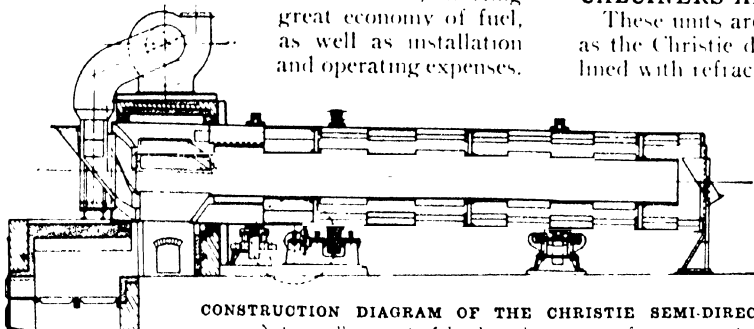
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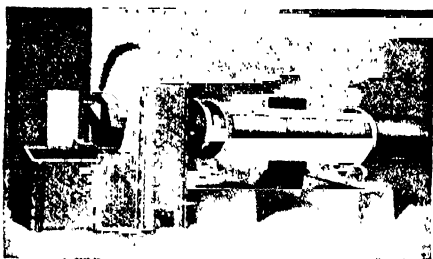
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**CHRISTIE**  
DRYERS · CALCINERS · COOLERS

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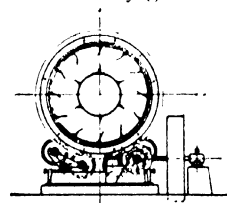
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# THE COOLING TOWER COMPANY, INC.

Specialists in Atmospheric Cooling

15 JOHN STREET, NEW YORK, N. Y.

Cable Address  
"COOLTOWCO"  
W. U. Code

## TERRITORIAL AGENTS

Atlanta, Ga., McKee & Wright Co., 258 Candler Annex.  
Baltimore, Md., Central Construction & Supply Co., 9 West Redwood St.  
Boston, Mass., Starkweather & Broadhurst, Inc., 79 Milk St.  
Birmingham, Ala., Fenster's Sales Co., Inc., 1311 Fourth Ave., W. F.  
Cincinnati, O., C. M. Robinson Co., 16 West 12th St.  
Cleveland, O., York Ohio Ice Machine Co., 1106 Woodland Ave.  
Detroit, Mich., The Coon DeVosier Co., 1772 West Lafayette Blvd.  
Fort Worth, Texas, Texas Manufacturing Co.  
Greenville, S. C., G. G. Slaughter Machinery Co.  
Houston, Texas, Rossmiter & Sauer, 410 Union Nat'l Bank Bldg.  
Kansas City, Mo., The Rawlings Industrial Equipment Co., Grand Avenue Temple Bldg.

Los Angeles, Cal., Pacific Sales Agency, 555 S. Rita Ave.  
New York City, Lasker & Munk, 220 Broadway.  
Philadelphia, Pa., Central Construction & Supply Co., 2224 Arch St.  
Pittsburgh, Pa., Wilhelm Griesser, 213 First Ave.  
St. Louis, Mo., Habbtzel & Smith Heating Co., 3160 South Grand Ave.  
San Francisco, Cal., H. F. Watkins Company, Hansford Bldg.  
Savannah, Ga., H. K. Painter Engineering Co., 14 West President St.  
Shreveport, La., The Sullivan Co., 110 Kirtland Bldg.  
Cuba, Havana, Victor G. Mendoza Co., Cuba No. 3.  
India, Calcutta, British American Machinery Co., Ltd.  
Canton, China, Grand Avenue Temple Bldg.

## PRODUCTS

All forms of atmospheric cooling apparatus, including atmospheric, mechanical draught and chimney cooling towers: from six gallons per minute capacity up; spray nozzle water cooling systems in any capacity. Spray nozzles for washing, scrubbing or cooling gases; where necessary of special material for handling acids. Air Washers.

## GENERAL

Our Cooling Apparatus is designed for hard, continuous and uninterrupted service with three principal objectives.

1. Maximum thermal efficiency—the attainment in a given climate of the lowest practicable temperature and greatest range of cooling.
2. Minimum maintenance expense—lowest repair bills, upkeep charges and depreciation.
3. Minimum operating expense—lowest labor and power charges. Also the lowest collateral losses chargeable to apparatus due to interrupted service from breakdowns, plugging and other causes of stoppage.

That our apparatus has successfully met the issues created by the diverse problems of our numerous clients is proved by repeat orders which constitute over fifty per cent. of our total business. We are proud of the fact that every installation we have made has been a success and it is a pleasure to refer to any and all of our customers.

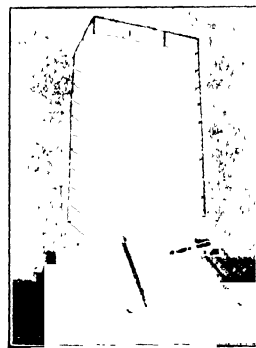
## COOLING TOWERS

Our towers operate on the weir system rather than the perforated pan or saw tooth principle, with the result that we have the greatest possible freedom from stoppage or plugging, which causes inefficiency and loss of time during a hot spell. Owing to our long experience in building cooling towers we are in a position to supply them under a definite guarantee.

Our standard towers are composite structures of steel and wood, but where acid-resisting qualities are required we build an all wood tower containing no metal whatever.

Our towers are built on the multiple unit system so they can be added to as the plant grows without affecting either their efficiency or appearance.

For complete description send for Catalog 9A.



COOLING TOWER

100 Gallons per Minute

## IMPACT SPRAY NOZZLES

Are the latest development in Spray Nozzle design to meet the requirements of water-cooling service. Perfect comminution by the jets with uniform and large distribution is effected at low pumping expense. The water passages, as will be noted from the cut, are devoid of obstructions and intricacy, thus avoiding loss due to eddying and accumulation of foreign matter with consequent plugging.

See Catalog 9A.



IMPACT SPRAY NOZZLE

## NOZZLE SPECIFICATION

Thread for Pipe Connection	Pressure in Pounds per Square Inch									
	6	7	8	9	10	12	15	20	25	30
No. of Nozzles	Capacity in U. S. Gallons per Minute									
	6	7	8	9	10	12	15	20	25	30
1/2"	34	38	42	46	50	54	58	62	66	70
3/4"	44	48	52	56	60	64	68	72	76	80
1"	54	58	62	66	70	74	78	82	86	90
1 1/4"	64	68	72	76	80	84	88	92	96	100
1 1/2"	74	78	82	86	90	94	98	102	106	110
2"	84	88	92	96	100	104	108	112	116	120
2 1/2"	94	98	102	106	110	114	118	122	126	130
3"	104	108	112	116	120	124	128	132	136	140
3 1/2"	114	118	122	126	130	134	138	142	146	150
4"	124	128	132	136	140	144	148	152	156	160
4 1/2"	134	138	142	146	150	154	158	162	166	170
5"	144	148	152	156	160	164	168	172	176	180
5 1/2"	154	158	162	166	170	174	178	182	186	190
6"	164	168	172	176	180	184	188	192	196	200
6 1/2"	174	178	182	186	190	194	198	202	206	210
7"	184	188	192	196	200	204	208	212	216	220
7 1/2"	194	198	202	206	210	214	218	222	226	230
8"	204	208	212	216	220	224	228	232	236	240
8 1/2"	214	218	222	226	230	234	238	242	246	250
9"	224	228	232	236	240	244	248	252	256	260
9 1/2"	234	238	242	246	250	254	258	262	266	270
10"	244	248	252	256	260	264	268	272	276	280
10 1/2"	254	258	262	266	270	274	278	282	286	290
11"	264	268	272	276	280	284	288	292	296	300
11 1/2"	274	278	282	286	290	294	298	302	306	310
12"	284	288	292	296	300	304	308	312	316	320
12 1/2"	294	298	302	306	310	314	318	322	326	330
13"	304	308	312	316	320	324	328	332	336	340
13 1/2"	314	318	322	326	330	334	338	342	346	350
14"	324	328	332	336	340	344	348	352	356	360
14 1/2"	334	338	342	346	350	354	358	362	366	370
15"	344	348	352	356	360	364	368	372	376	380
15 1/2"	354	358	362	366	370	374	378	382	386	390
16"	364	368	372	376	380	384	388	392	396	400
16 1/2"	374	378	382	386	390	394	398	402	406	410
17"	384	388	392	396	400	404	408	412	416	420
17 1/2"	394	398	402	406	410	414	418	422	426	430
18"	404	408	412	416	420	424	428	432	436	440
18 1/2"	414	418	422	426	430	434	438	442	446	450
19"	424	428	432	436	440	444	448	452	456	460
19 1/2"	434	438	442	446	450	454	458	462	466	470
20"	444	448	452	456	460	464	468	472	476	480
20 1/2"	454	458	462	466	470	474	478	482	486	490
21"	464	468	472	476	480	484	488	492	496	500
21 1/2"	474	478	482	486	490	494	498	502	506	510
22"	484	488	492	496	500	504	508	512	516	520
22 1/2"	494	498	502	506	510	514	518	522	526	530
23"	504	508	512	516	520	524	528	532	536	540
23 1/2"	514	518	522	526	530	534	538	542	546	550
24"	524	528	532	536	540	544	548	552	556	560
24 1/2"	534	538	542	546	550	554	558	562	566	570
25"	544	548	552	556	560	564	568	572	576	580
25 1/2"	554	558	562	566	570	574	578	582	586	590
26"	564	568	572	576	580	584	588	592	596	600
26 1/2"	574	578	582	586	590	594	598	602	606	610
27"	584	588	592	596	600	604	608	612	616	620
27 1/2"	594	598	602	606	610	614	618	622	626	630
28"	604	608	612	616	620	624	628	632	636	640
28 1/2"	614	618	622	626	630	634	638	642	646	650
29"	624	628	632	636	640	644	648	652	656	660
29 1/2"	634	638	642	646	650	654	658	662	666	670
30"	644	648	652	656	660	664	668	672	676	680
30 1/2"	654	658	662	666	670	674	678	682	686	690
31"	664	668	672	676	680	684	688	692	696	700
31 1/2"	674	678	682	686	690	694	698	702	706	710
32"	684	688	692	696	700	704	708	712	716	720
32 1/2"	694	698	702	706	710	714	718	722	726	730
33"	704	708	712	716	720	724	728	732	736	740
33 1/2"	714	718	722	726	730	734	738	742	746	750
34"	724	728	732	736	740	744	748	752	756	760
34 1/2"	734	738	742	746	750	754	758	762	766	770
35"	744	748	752	756	760	764	768	772	776	780
35 1/2"	754	758	762	766	770	774	778	782	786	790
36"	764	768	772	776	780	784	788	792	796	800
36 1/2"	774	778	782	786	790	794	798	802	806	810
37"	784	788	792	796	800	804	808	812	816	820
37 1/2"	794	798	802	806	810	814	818	822	826	830
38"	804	808	812	816	820	824	828	832	836	840
38 1/2"	814	818	822	826	830	834	838	842	846	850
39"	824	828	832	836	840	844	848	852	856	860
39 1/2"	834	838	842	846	850	854	858	862	866	870
40"	844	848	852	856	860	864	868	872	876	880
40 1/2"	854	858	862	866	870	874	878	882	886	890
41"	864	868	872	876	880	884	888	892	896	900
41 1/2"	874	878	882	886	890	894	898	902	906	910
42"	884	888	892	896	900	904	908	912	916	920
42 1/2"	894	898	902	906	910	914	918	922	926	930
43"	904	908	912	916	920	924	928	932	936	940
43 1/2"	914	918	922	926	930	934	938	942	946	950
44"	924	928	932	936	940	944	948	952	956	960
44 1/2"	934	938	942	946	950	954	958	962	966	970
45"	944	948	952	956	960	964	968	972	976	980
45 1/2"	954	958	962	966	970	974	978	982	986	990
46"	964	968	972	976	980	984	988	992	996	1000
46 1/2"	974	978	982	986	990	994	998	1002	1006	1010
47"	984	988	992	996	1000	1004	1008	1012	1016	1020
47 1/2"	994	998	1002	1006	1010	1014	1018	1022	1026	1030
48"	1004	1008	1012	1016	1020	1024	1028	1032	1036	1040
48 1/2"	1014	1018	1022	1026	1030	1034	1038	1042	1046	1050
49"	1024	1028	1032	1036	1040	1044	1048	1052	1056	1060
49 1/2"	1034	1038	1042	1046	1050	1054	1058	1062	1066	1070
50"	1044	1048	1052	1056	1060	1064	1068	1072	1076	1080
50 1/2"	1054	1058	1062	1066	1070	1074	1078	1082	1086	1090</

# L. R. CHRISTIE COMPANY

Manufacturers of  
Dryers, Calciners, Roasters and Coolers  
501 Peoples Bank Building  
PITTSBURGH, PA.

## PRODUCTS

Rotary Dryers, Calciners, Roasters and Coolers.

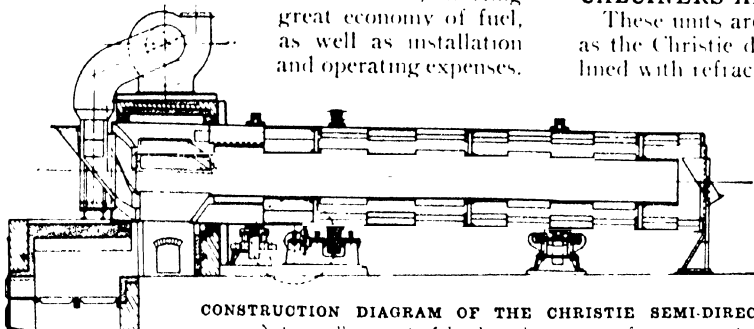
Also manufacturers of Rotary Continuous Retorts.

## TYPES OF DRYERS

The L. R. Christie Company manufactures every type of rotary dryer. Certain types have been improved and perfected to the very highest degree of efficiency. Chief among these are the semi-direct heat dryer, the indirect heat dryer, the indirect steam heat dryer and the direct heat dryer.

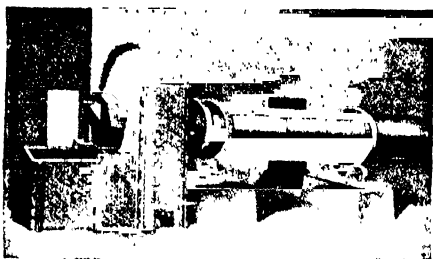
### SEMI-DIRECT HEAT DRYER

An internal heat flue type having a central flue through which the gases first pass, giving up their heat to the surrounding material and later passing directly through material in counter direction, effecting great economy of fuel, as well as installation and operating expenses.



CONSTRUCTION DIAGRAM OF THE CHRISTIE SEMI-DIRECT HEAT DRYER

Note: small amount of brick work necessary for permanent installation.  
A continuous dryer perfected by Christie



SEMI-DIRECT HEAT DRYER

### INDIRECT HEAT DRYER

In this dryer, the hot gases are not permitted to come in contact with the material. The heat is applied directly to the outer cylinder as it rotates and returns through a flue in center of drying compartment.

As all joints are closed, no dust collector is needed, even though materials are very finely divided.

This dryer is substantially a rotary retort. Its true economy is evidenced by the remarkably low temperatures at exhaust.

### DIRECT HEAT DRYER

A single shell, direct fired cylinder for rough work. Furnace at feed or discharge according to materials being dried.

**CHRISTIE**  
DRYERS · CALCINERS · COOLERS

### STEAM HEATED DRYER

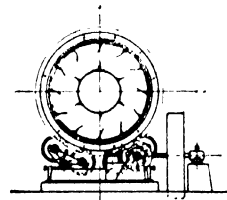
Frequently in drying certain materials a high temperature has been found injurious. To offset such a possibility and maintain an even low heat, steam may be used as a heat medium, applied either through an internal coil or by air heated in an external coil.



DRYER USING INDIRECT STEAM HEAT

### CALCINERS AND ROASTERS

These units are of practically the same construction as the Christie direct heat dryers. A rotary cylinder lined with refractory brick is heated by gases directly



applied to material. Exceedingly high temperatures are secured, moisture driven off, foreign matter burned out and chemical reactions obtained.

### SERVICES

In order that the L. R. Christie Company may be of maximum service in the solution of drying problems, the following details should be kept in mind when writing for information:

Character of material to be dried.

Capacity in dry tons of 2000 lbs. per hour.

Initial and final percentage of moisture. Is moisture free or combined? If combined, at what temperature is it driven off?

Temperature which material will stand without injury.

Fineness (mesh) of materials.

Are materials injured by direct contact with furnace gases?

Is waste heat available? Temperature. Quantity.

Fuel to be used: coal, oil, gas or waste heat.

Twenty-one years of specialized effort in designing and operating drying and cooling machinery have been responsible for these advanced models. They are not untried experiments. Their marked economy, made possible through many improvements over old types of dryers, recommends them immediately to the discriminating buyer.

**Crucibles, Gooch**

With perforated bottom; glazed throughout except outside bottom surface.

Size number	2	2a	3	4
Diameter rim, mm	27	31	35	40
Diameter bottom, mm	18	20	22	25
Height, mm	10	13	40	43
Diameter perforations, mm	1	1	1	1
Capacity, cc	10	20	25	35

**Crucible Covers**

For high form crucibles, glazed throughout

Size number	000	00	0	1	1a	2	3	4	5
Diameter, mm	32	35	42	47	56	59	73	81	95

**Discs, Perforated**

For Caldwell crucibles and for funnels; glazed on top surface.

Size number	0	1	2	3	4	5
Diameter, mm	15	18	20	22	25	30
Thickness, mm	2	2	2	2	3	4
Diameter perforations, mm	1	1	1	1	1	1
Size number	6	7	8	9	10	11
Diameter, mm	38	50	60	75	100	150
Thickness, mm	4	4	4	4	6	6
Diameter perforations, mm	1	1	1	1	1	1

**Dishes, Evaporating**

With lip; Nos. 000 to 4 glazed throughout except rim; Nos. 5 to 13 glazed inside and half-way down outside.

Size number	000	00	0	1	2	3	4	5	6
Diameter, mm	60	70	80	85	90	100	110	120	145
Height, mm	24	27	30	33	37	42	45	50	48
Capacity, cc	35	60	80	100	140	175	210	300	385
Size number	6a	7	8	8a	9	10	11	12	13
Diameter, mm	162	185	215	230	265	305	360	400	460
Height, mm	51	54	61	70	80	95	116	140	175
Capacity, cc	535	765	1285	1430	2200	3250	5700	10000	16500

**Dishes, Evaporating**

With wide lip and heavy welter rim; glazed inside and half-way down outside.

Size number	12	13
Diameter, mm	100	460
Height, mm	140	175
Capacity, cc	10000	16500

**Dye Pots, See Beakers****Filter Cones**

Glazed throughout except rim.

Size number	3	4
Diameter, mm	50	63
Height, mm	43	62
Diameter holes, mm	1.5	1.5

**Funnels, Buchner**

With fixed perforated plate; glazed throughout except rim.

Size number	0	1	2	2a	3	4	4a	5
Outside diameter, mm	48	66	82	102	122	138	163	200
Inside diameter, mm	42	60	75	95	115	130	155	190
Diameter perforated area, mm	28	45	60	80	100	115	140	175
Distance, rim to perforated plate, mm	17	27	37	46	57	61	66	75
Height over all, mm	76	100	110	165	195	215	234	280
Length of tube, mm	46	50	70	80	90	100	110	130
Diameter of tube, mm	14	8	9	12	14	16	18	20

**Funnels, Hirsch**

With fixed perforated plate; glazed throughout except rim.

Size number	0000	000	00	0	1	2	3	4
Diameter top, mm	54	50	75	92	103	120	140	163
Diameter perforated area, mm	16	28	28	28	28	45	45	60
Distance, rim to perforated plate, mm	26	12	18	33	41	45	62	69
Height over all, mm	66	61	95	121	131	158	185	217
Length of tube, mm	84	30	41	52	56	68	79	93
Diameter of tube, mm	12	10	10	12	14	15	16	17

**Mortars with Pestles**

With lip; glazed outside; Pestles glazed to grinding surface.

Size number	0	1	2	3	4	5
Diameter, mm	70	90	115	130	160	210
Height, mm	42	58	70	80	100	130
Capacity, cc	60	135	275	400	750	1900
Length of pestle, mm	110	135	170	190	240	240

**Plates, Color**

Glazed throughout except bottom surface.

Size number	1	2	3	4
Length, mm	110	160	180	180
Width, mm	90	125	110	140
Thickness, mm	7	10	10	10
Number of depressions	12	12	24	30
Diameter of depressions, mm	20	30	20	20
Depth of depressions, mm	5	5	5	5

**Plates, Desiccator**

On three small feet; glazed on top.

Size number	0	1	2	2a	2b	3	4	5
Diameter, mm	85	95	115	120	125	140	190	230
Thickness, mm	4	4	4	4	4	5	5	5
Number of holes	3	3	4	5	8	5	7	8
Diam. of holes	23	30	30	23	23	30	30	80

**Plates, Streak**

Unglazed.

Size number	1	2	3	4	5	6
Length, mm	65	70	85	90	100	140
Width, mm	50	40	60	65	80	90
Thickness, mm	3	3	4	4	4	4

**Spatulas**

Long Spatula on one end, knob on the other; glazed throughout.

Size number	1	2	3	4	5	5a	6
Length, mm	115	155	200	275	310	345	442

**Spatulas**

Spatula on both ends; glazed throughout.

Size number	1	2	3	4	5	5a	6	7
Length, mm	105	120	150	195	212	225	280	348

**Spatulas**

Spatula on one end, spoon on the other; glazed throughout.

Size number	1	1a	2	3	4	4a	5	6
Length, mm	96	120	140	160	190	203	247	400

**Tubes, Pyrometer**

Glazed outside only. Furnished glazed throughout on special order.

Size number	0	1	2	3	4	5	5a	6	7
Outside diameter, mm	10	12.6	14	17	20	28	30	38	60
Inside diameter, mm	6	10.5	10	12	15	20	25	28	43
Length, mm	1000	1000	1000	1000	1000	1000	1000	1000	1000

**Porous Cells, Rectangular**

Size number	0	1	2	3
Length, mm	70	125	305	840
Width, mm	20	50	63	105
Height, mm	90	170	305	335

**Porous Cups, Cylindrical**

Size number	1	2	2a	3	4	5	5a	6	7
Diameter, mm	25	30	38	25	40	62	50	55	76
Height, mm	76	76	75	102	90	100	126	160	127
Size number	8	8a	9	10	11	12	13	14	15
Diameter, mm	76	80	88	90	100	150	178	133	200
Height, mm	177	200	265	210	280	250	228	305	510

In addition to the above Porcelain Apparatus and Utensils, we manufacture Porcelain Acid Receivers, Ball Mills, Bottle Rests, Combustion Capsules, Graduated Pitchers, Glazed Plates, Mercury Troughs, Swimming Cups, Centrifuge Baskets, Bunsen Burners, Delivery Tubes, Combustion Tubes, Porous Filters, etc.

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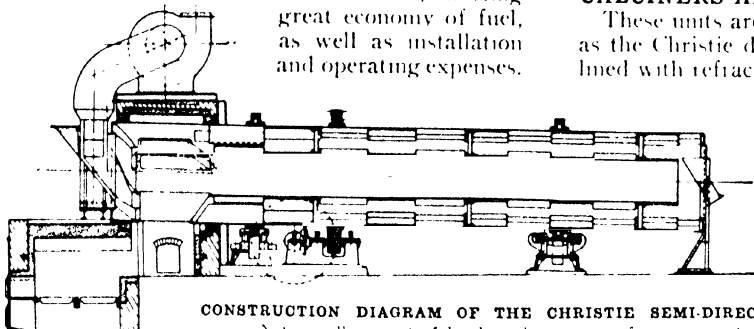
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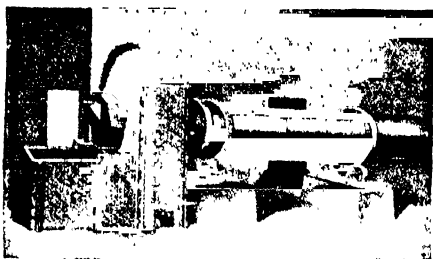
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Note: small amount of brick work necessary for permanent installation.  
A continuous dryer perfected by Christie



SEMI-DIRECT HEAT DRYER

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In this dryer, the hot gases are not permitted to come in contact with the material. The heat is applied directly to the outer cylinder as it rotates and returns through a flue in center of drying compartment.

As all joints are closed, no dust collector is needed, even though materials are very finely divided.

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### DIRECT HEAT DRYER

A single shell, direct fired cylinder for rough work. Furnace at feed or discharge according to materials being dried.

**CHRISTIE**  
DRYERS · CALCINERS · COOLERS

### STEAM HEATED DRYER

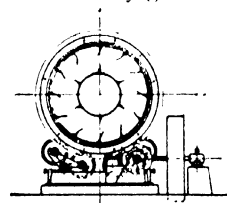
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DRYER USING INDIRECT STEAM HEAT

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**Crucibles, Gooch**

With perforated bottom; glazed throughout except outside bottom surface.

Size number	2	2a	3	4
Diameter rim, mm	27	31	35	40
Diameter bottom, mm	18	20	22	25
Height, mm	10	13	40	43
Diameter perforations, mm	1	1	1	1
Capacity, cc	10	20	25	35

**Crucible Covers**

For high form crucibles, glazed throughout

Size number	000	00	0	1	1a	2	3	4	5
Diameter, mm	32	35	42	47	56	59	73	81	95

**Discs, Perforated**

For Caldwell crucibles and for funnels; glazed on top surface.

Size number	0	1	2	3	4	5
Diameter, mm	15	18	20	22	25	30
Thickness, mm	2	2	2	2	3	4
Diameter perforations, mm	1	1	1	1	1	1
Size number	6	7	8	9	10	11
Diameter, mm	38	50	60	75	100	150
Thickness, mm	4	4	4	4	6	6
Diameter perforations, mm	1	1	1	1	1	1

**Dishes, Evaporating**

With lip; Nos. 000 to 4 glazed throughout except rim; Nos. 5 to 13 glazed inside and half-way down outside.

Size number	000	00	0	1	2	3	4	5	6
Diameter, mm	60	70	80	85	90	100	110	120	145
Height, mm	24	27	30	33	37	42	45	50	48
Capacity, cc	35	60	80	100	140	175	210	300	385
Size number	6a	7	8	8a	9	10	11	12	13
Diameter, mm	162	185	215	230	265	305	360	400	460
Height, mm	51	54	61	70	80	95	116	140	175
Capacity, cc	535	765	1285	1430	2200	3250	5700	10000	16500

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With wide lip and heavy welter rim; glazed inside and half-way down outside.

Size number	12	13
Diameter, mm	100	460
Height, mm	140	175
Capacity, cc	10000	16500

**Dye Pots, See Beakers****Filter Cones**

Glazed throughout except rim.

Size number	3	4
Diameter, mm	50	63
Height, mm	43	62
Diameter holes, mm	1.5	1.5

**Funnels, Buchner**

With fixed perforated plate; glazed throughout except rim.

Size number	0	1	2	2a	3	4	4a	5
Outside diameter, mm	48	66	82	102	122	138	163	200
Inside diameter, mm	42	60	75	95	115	130	155	190
Diameter perforated area, mm	28	45	60	80	100	115	140	175
Distance, rim to perforated plate, mm	17	27	37	46	57	61	66	75
Height over all, mm	76	100	110	165	195	215	234	280
Length of tube, mm	46	50	70	80	90	100	110	130
Diameter of tube, mm	14	8	9	12	14	16	18	20

**Funnels, Hirsch**

With fixed perforated plate; glazed throughout except rim.

Size number	0000	000	00	0	1	2	3	4
Diameter top, mm	54	50	75	92	103	120	140	163
Diameter perforated area, mm	16	28	28	28	28	45	45	60
Distance, rim to perforated plate, mm	26	12	18	33	41	45	62	69
Height over all, mm	66	61	95	121	131	158	185	217
Length of tube, mm	84	30	41	52	56	68	79	93
Diameter of tube, mm	12	10	10	12	14	15	16	17

**Mortars with Pestles**

With lip; glazed outside; Pestles glazed to grinding surface.

Size number	0	1	2	3	4	5
Diameter, mm	70	90	115	130	160	210
Height, mm	42	58	70	80	100	130
Capacity, cc	60	135	275	400	750	1900
Length of pestle, mm	110	135	170	190	240	240

**Plates, Color**

Glazed throughout except bottom surface.

Size number	1	2	3	4
Length, mm	110	160	180	180
Width, mm	90	125	110	140
Thickness, mm	7	10	10	10
Number of depressions	12	12	24	30
Diameter of depressions, mm	20	30	20	20
Depth of depressions, mm	5	5	5	5

**Plates, Desiccator**

On three small feet; glazed on top.

Size number	0	1	2	2a	2b	3	4	5
Diameter, mm	85	95	115	120	125	140	190	230
Thickness, mm	4	4	4	4	4	5	5	5
Number of holes	3	3	4	5	8	5	7	8
Diam. of holes	23	30	30	23	23	30	30	80

**Plates, Streak**

Unglazed.

Size number	1	2	3	4	5	6
Length, mm	65	70	85	90	100	140
Width, mm	50	40	60	65	80	90
Thickness, mm	3	3	4	4	4	4

**Spatulas**

Long Spatula on one end, knob on the other; glazed throughout.

Size number	1	2	3	4	5	5a	6
Length, mm	115	155	200	275	310	345	442

**Spatulas**

Spatula on both ends; glazed throughout.

Size number	1	2	3	4	5	5a	6	7
Length, mm	105	120	150	195	212	225	280	348

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Spatula on one end, spoon on the other; glazed throughout.

Size number	1	1a	2	3	4	4a	5	6
Length, mm	96	120	140	160	190	203	247	400

**Tubes, Pyrometer**

Glazed outside only. Furnished glazed throughout on special order.

Size number	0	1	2	3	4	5	5a	6	7
Outside diameter, mm	10	12.6	14	17	20	28	30	38	60
Inside diameter, mm	6	10.5	10	12	15	20	25	28	43
Length, mm	1000	1000	1000	1000	1000	1000	1000	1000	1000

**Porous Cells, Rectangular**

Size number	0	1	2	3
Length, mm	70	125	305	840
Width, mm	20	50	63	105
Height, mm	90	170	305	335

**Porous Cups, Cylindrical**

Size number	1	2	2a	3	4	5	5a	6	7
Diameter, mm	25	30	38	25	40	62	50	55	76
Height, mm	76	76	75	102	90	100	126	160	127
Size number	8	8a	9	10	11	12	13	14	15
Diameter, mm	76	80	88	90	100	150	178	133	200
Height, mm	177	200	265	210	280	250	228	305	510

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**SERVICE**

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**INFORMATION**

Write us for catalog and samples, which will be cheerfully furnished, and we will advise you of the nearest source of supply.

# CORNING GLASS WORKS

World's Largest Makers of Technical Glass

NEW YORK OFFICE  
501 Fifth Avenue

MAIN FACTORY AND OFFICE  
Corning, N. Y.

## PRODUCTS

Glassware, mainly for Technical Requirements.

## SERVICES

Corning Glass Works have made the production of technical glassware their special field for fifty years. They maintain the most fully equipped laboratory in the world devoted to the study of the technical problems of glass manufacture. The results of research conducted by Corning Glass Works have revolutionized some very important industries during the past twenty years. We stand ready to cooperate with any manufacturer by developing special glasses to meet the particular requirements of his service if our present list does not afford exactly what is needed. The service of our chemists and physicists is at your disposal. Our designers can determine how to prevent unnecessary expense and how to secure maximum efficiency by avoiding unsuitable designs.

## PYREX

An extraordinarily low expansion borosilicate glass Pyrex satisfactorily replaces porcelain and quartz glass for many purposes because of its low linear expansion coefficient ( $25^{\circ}$  to  $350^{\circ}$  C = 0.0000032). The simple chemical composition of Pyrex is an advantage as regards possible contamination of liquids in contact with it. It contains no metals of the magnesia-lime-zinc group and no heavy metals.

Aside from Chemical ware and Baking ware, this glass is used for a great variety of special purposes, such as sight glasses, gauge tubes, etc.

## BAKING WARE

Casseroles, plates, pans, etc. Also oven door plates, percolator flasks and tops; made from a low expansion borosilicate glass of unique properties, marketed under the trade-mark "PYREX."

## CHEMICAL WARE

Beakers, flasks and special laboratory apparatus exclusively in PYREX glass.

## CYLINDERS

In all diameters and lengths according to specifications from either lead or PYREX glass.

## BATTERY JARS

For primary or storage cells in Corning "NONEX" (low expansion heat resisting) glass only; also Jars for Leyden cells.

## BULBS

All types of standard bulbs, also special bulbs for X-ray apparatus.

## LIGHT FILTERS

Glasses of special spectral absorption or transmission, such as:

Daylite, No. G 172 CD, for production of artificial daylight, very accurate with Nitrogen filled lamp. Noviol, No. G 38D, total absorption of ultra-violet. Noviweld, No. G 39, in various shades for protection against excessive illumination in arc welding and similar processes.

Ultra No. G 120, high transmission of ultra-violet. No. G 11 F, high transmission of X-rays. No. G 24, absorption of all visible spectrum except red.

## OPTICAL GLASSES

Of special refractive indices and dispersion for lens-grinding, including lime crown glass of 1.523 index, lead flints of 1.6165 and 1.68 index,—also standard colors such as Amber, Smoke, Fieuzal, Amethyst, etc.; see also Light Filters above.

## TUBING

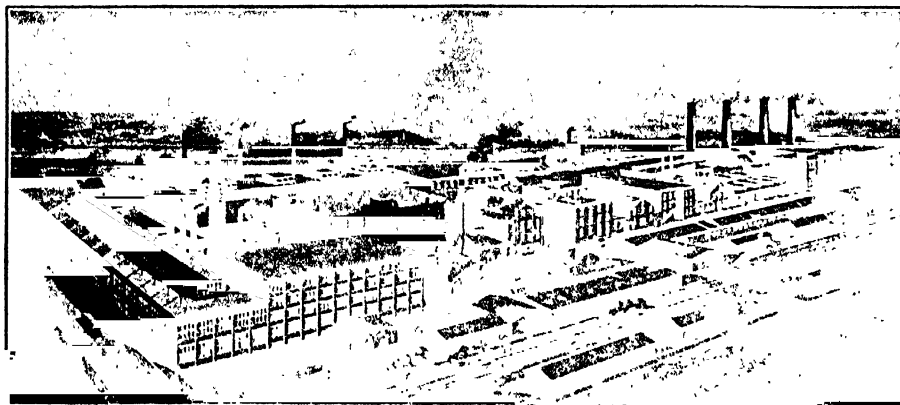
Including all varieties of Thermometer and Barometer tubing, Brewer, Clinical, Plaque, etc., in standard lead glass, also in Corning Normal and Corning Borosilicate Glasses. Special tubes for acid condensers, for laboratory service, for lamp working, etc.

## X-RAY SHIELDS

Glasses of special composition for protection against X-rays.

## INQUIRIES

Address the Sales Department, Corning Glass Works, 501 Fifth Avenue, New York City, or Corning, N. Y., for information, price list, descriptive circulars, etc.



FACTORY OF THE CORNING GLASS WORKS, CORNING, N. Y.

**Crucibles, Gooch**

With perforated bottom; glazed throughout except outside bottom surface.

Size number	2	2a	3	4
Diameter rim, mm	27	31	35	40
Diameter bottom, mm	18	20	22	25
Height, mm	10	13	40	43
Diameter perforations, mm	1	1	1	1
Capacity, cc	10	20	25	35

**Crucible Covers**

For high form crucibles, glazed throughout

Size number	000	00	0	1	1a	2	3	4	5
Diameter, mm	32	35	42	47	56	59	73	81	95

**Discs, Perforated**

For Caldwell crucibles and for funnels; glazed on top surface.

Size number	0	1	2	3	4	5
Diameter, mm	15	18	20	22	25	30
Thickness, mm	2	2	2	2	3	4
Diameter perforations, mm	1	1	1	1	1	1
Size number	6	7	8	9	10	11
Diameter, mm	38	50	60	75	100	150
Thickness, mm	4	4	4	4	6	6
Diameter perforations, mm	1	1	1	1	1	1

**Dishes, Evaporating**

With lip; Nos. 000 to 4 glazed throughout except rim; Nos. 5 to 13 glazed inside and half-way down outside.

Size number	000	00	0	1	2	3	4	5	6
Diameter, mm	60	70	80	85	90	100	110	120	145
Height, mm	24	27	30	33	37	42	45	50	48
Capacity, cc	35	60	80	100	140	175	210	300	385
Size number	6a	7	8	8a	9	10	11	12	13
Diameter, mm	162	185	215	230	265	305	360	400	460
Height, mm	51	54	61	70	80	95	116	140	175
Capacity, cc	535	765	1285	1430	2200	3250	5700	10000	16500

**Dishes, Evaporating**

With wide lip and heavy welter rim; glazed inside and half-way down outside.

Size number	12	13
Diameter, mm	100	460
Height, mm	140	175
Capacity, cc	10000	16500

**Dye Pots, See Beakers****Filter Cones**

Glazed throughout except rim.

Size number	3	4
Diameter, mm	50	63
Height, mm	43	62
Diameter holes, mm	1.5	1.5

**Funnels, Buchner**

With fixed perforated plate; glazed throughout except rim.

Size number	0	1	2	2a	3	4	4a	5
Outside diameter, mm	48	66	82	102	122	138	163	200
Inside diameter, mm	42	60	75	95	115	130	155	190
Diameter perforated area, mm	28	45	60	80	100	115	140	175
Distance, rim to perforated plate, mm	17	27	37	46	57	61	66	75
Height over all, mm	76	100	110	165	195	215	234	280
Length of tube, mm	46	50	70	80	90	100	110	130
Diameter of tube, mm	14	8	9	12	14	16	18	20

**Funnels, Hirsch**

With fixed perforated plate; glazed throughout except rim.

Size number	0000	000	00	0	1	2	3	4
Diameter top, mm	54	50	75	92	103	120	140	163
Diameter perforated area, mm	16	28	28	28	28	45	45	60
Distance, rim to perforated plate, mm	26	12	18	33	41	45	62	69
Height over all, mm	66	61	95	121	131	158	185	217
Length of tube, mm	84	30	41	52	56	68	79	93
Diameter of tube, mm	12	10	10	12	14	15	16	17

**Mortars with Pestles**

With lip; glazed outside; Pestles glazed to grinding surface.

Size number	0	1	2	3	4	5
Diameter, mm	70	90	115	130	160	210
Height, mm	42	58	70	80	100	130
Capacity, cc	60	135	275	400	750	1900
Length of pestle, mm	110	135	170	190	240	240

**Plates, Color**

Glazed throughout except bottom surface.

Size number	1	2	3	4
Length, mm	110	160	180	180
Width, mm	90	125	110	140
Thickness, mm	7	10	10	10
Number of depressions	12	12	24	30
Diameter of depressions, mm	20	30	20	20
Depth of depressions, mm	5	5	5	5

**Plates, Desiccator**

On three small feet; glazed on top.

Size number	0	1	2	2a	2b	3	4	5
Diameter, mm	85	95	115	120	125	140	190	230
Thickness, mm	4	4	4	4	4	5	5	5
Number of holes	3	3	4	5	8	5	7	8
Diam. of holes	23	30	30	23	23	30	30	80

**Plates, Streak**

Unglazed.

Size number	1	2	3	4	5	6
Length, mm	65	70	85	90	100	140
Width, mm	50	40	60	65	80	90
Thickness, mm	3	3	4	4	4	4

**Spatulas**

Long Spatula on one end, knob on the other; glazed throughout.

Size number	1	2	3	4	5	5a	6
Length, mm	115	155	200	275	310	345	442

**Spatulas**

Spatula on both ends; glazed throughout.

Size number	1	2	3	4	5	5a	6	7
Length, mm	105	120	150	195	212	225	280	348

**Spatulas**

Spatula on one end, spoon on the other; glazed throughout.

Size number	1	1a	2	3	4	4a	5	6
Length, mm	96	120	140	160	190	203	247	400

**Tubes, Pyrometer**

Glazed outside only. Furnished glazed throughout on special order.

Size number	0	1	2	3	4	5	5a	6	7
Outside diameter, mm	10	12.6	14	17	20	28	30	38	60
Inside diameter, mm	6	10.5	10	12	15	20	25	28	43
Length, mm	1000	1000	1000	1000	1000	1000	1000	1000	1000

**Porous Cells, Rectangular**

Size number	0	1	2	3
Length, mm	70	125	305	840
Width, mm	20	50	63	105
Height, mm	90	170	305	335

**Porous Cups, Cylindrical**

Size number	1	2	2a	3	4	5	5a	6	7
Diameter, mm	25	30	38	25	40	62	50	55	76
Height, mm	76	76	75	102	90	100	126	160	127
Size number	8	8a	9	10	11	12	13	14	15
Diameter, mm	76	80	88	90	100	150	178	133	200
Height, mm	177	200	265	210	280	250	228	305	510

In addition to the above Porcelain Apparatus and Utensils, we manufacture Porcelain Acid Receivers, Ball Mills, Bottle Rests, Combustion Capsules, Graduated Pitchers, Glazed Plates, Mercury Troughs, Swimming Cups, Centrifuge Baskets, Bunsen Burners, Delivery Tubes, Combustion Tubes, Porous Filters, etc.

**STOCKS**

Coors Porcelain is carried in stock by the leading dealers in laboratory supplies throughout the United States and Canada. Should your dealer be temporarily unable to supply your needs, notify us and we will see to it that you are promptly supplied.

We maintain a sufficient stock at our plant to promptly fill orders from dealers.

**SERVICE**

We are at all times prepared to undertake the production of special forms of porcelain apparatus in quantity.

**INFORMATION**

Write us for catalog and samples, which will be cheerfully furnished, and we will advise you of the nearest source of supply.

# CRANE CO.

## Manufacturers of Valves, Fittings, Steam Specialties

GENERAL OFFICES

836 South Michigan Avenue, CHICAGO, ILL.

WORKS: CHICAGO, ILL., and BRIDGEPORT, CONN.

### SALES OFFICES

ABERDEEN  
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### CRANE LIMITED

MONTREAL  
SYDNEY, N. S. W.

TORONTO  
QUEBEC

VANCOUVER  
HALIFAX

WINNIPEG  
OTTAWA

LONDON, ENG.  
CALGARY

### PRODUCTS

We manufacture a complete line of Valves, Cocks, and Fittings in brass, iron, ferrosteel and cast steel used by the chemical industries; malleable and cast iron screwed fittings, drainage fittings; hydraulic valves and fittings; flanged fittings of every description; steam specialties; automatic stop-check valves; emergency, exhaust relief and back-pressure valves; steam and oil separators; steam traps; pop safety and relief valves; Indicator posts; floor stands; geared valves and valves with floor stands; hydraulic lift gate valves; motor operated valves; clean-out pockets; emergency engine stop valves; throttle valves; pressure regulators; temperature control valves; open-float steam traps; blow-off valves; packing; unions; expansion joints; gate valves; globe, angle, cross and check valves; radiator valves; flanged pipe joints; valves and fittings for ammonia; steel valves and cast steel fittings especially constructed for superheated steam.

Estimates furnished from drawings submitted on complete piping equipment, pipe bends, etc.

We are distributors of pipe, heating and plumbing materials.

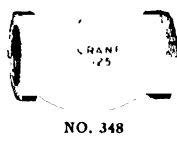
Any of the above articles will be cast in special metals to withstand the action of acids, etc., when so ordered.

The following material is especially adapted for use in chemical plants.

### ALL IRON GLOBE AND ANGLE VALVES, No. 348

Sizes  $\frac{1}{2}$ -inch and larger. All parts made of iron; also made brass mounted.

Large sizes with outside screw and yoke with iron body or all iron.



NO. 348

### BRASS GLOBE AND ANGLE VALVES, No. 7

Made with Jenkins disc, brass body, malleable iron centerpiece ring, packing nut and wheel. Sizes  $\frac{1}{4}$  to 2-inch.

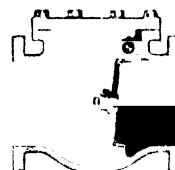


NO. 7

### STANDARD IRON BODY SWING CHECK VALVES (No. 373)

Made with brass faced or leather disc for 125 pounds steam working pressure.

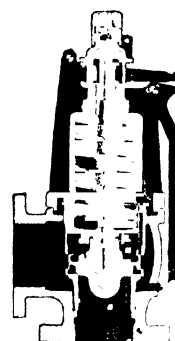
The extra heavy pattern, with brass faced disc, is suitable for 250 pounds steam working pressure. Sizes 2-inch and larger.



NO. 373

### POP SAFETY VALVES (No. 1117)

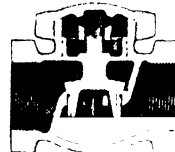
Made in various spring loaded types to meet all conditions of service. Outside spring and yoke valves for any pressure up to 250 pounds are made to comply with the requirements of the A. S. M. E. Boiler Code. Sizes  $2\frac{1}{2}$  to 41  $\frac{1}{2}$ -inch.



NO. 1117

### BRASS LIFT CHECK VALVES (No. 92 E)

An extra heavy lift check valve with a dashpot. Made in sizes  $\frac{1}{4}$  to 3-inch.



NO. 92 E

### EXTRA HEAVY BRASS GATE VALVES (No. 66 E)

A very heavy valve of the wedge disc type for 250 pounds steam pressure. Made in sizes  $\frac{3}{8}$  to 3-inch.



NO. 66 E

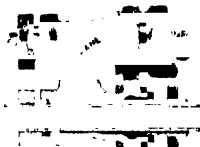
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**AMMONIA VALVES AND FITTINGS**

Standardized so the trimmings of different valves, as well as the valves and fittings themselves, may be interchanged without changing the length of connecting pipe lines. Made with tongue and groove ends.



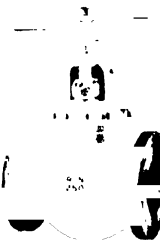
NO. 1504 AMMONIA GLOBE VALVE



NO. 1575 RETURN BEND



NO. 1504 AMMONIA OIL SEPARATOR



NO. 21E STEEL GLOBE VALVE

Steel valves are made with different materials for the trimmings, depending on the service requirements.



NO. 23E STEEL ANGLE VALVE

**EXTRA HEAVY CAST STEEL SWING CHECK VALVES (No. 39 D)**

Made with cast steel body and hard metal seats. Designed for use on boiler feed lines carrying pressures up to 400 pounds.



NO. 39-D

**PRESSURE REGULATORS**

Made for any initial pressure of steam or air up to 250 pounds, also for superheated steam at 200 pounds, or a total temperature not to exceed 500 degrees F.



NO. 962 PRESSURE REGULATOR

**STEAM AND OIL SEPARATORS**

Made in several patterns: low pressure up to 25 pounds, standard up to 125 pounds, extra heavy up to 250 pounds.



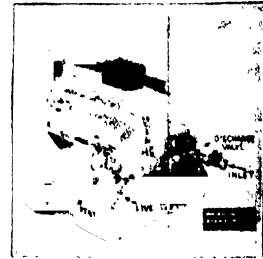
NO. 09 STEAM SEPARATOR



NO. 08 OIL SEPARATOR

**CRANETILT STEAM TRAPS**

Made in three types; non-return, three-valve lifting or vacuum; direct return. Write for circular on condensation.



CRANETILT THREE-VALVE LIFTING TRAP

**EXTRA HEAVY HARD METAL GLOBE AND ANGLE VALVES (No. 4)**

Made for severe service. Body and disc made of "hard metal" which is almost as hard as steel and successfully resists the cutting effects of steam and water. Sizes 3/4-inch and larger have a gland. For steam working pressures up to 250 pounds.



NO. 4

**EXTRA HEAVY HARD METAL STEAM COCKS**

Made of "hard metal" with liberal bearings and carefully finished. This cock will stay tight and give good service for steam working pressures up to 250 pounds.



NO. 80-E SQUARE HEAD

**EXTRA HEAVY BRASS GLOBE AND ANGLE VALVES (No. 87 E)**

Made outside screw and yoke for 250 pounds steam working pressure. Bolted gland, renewable seat ring, Crane special brass body and yoke, Crane hard metal disc and seat, brass gland and nuts, brass bonnet nuts. Made in sizes 1 1/2 to 4-inch.



NO. 87-E

# CRESSON-MORRIS COMPANY

Engineers, Founders, Machinists

18TH STREET AND ALLEGHENY AVENUE, PHILADELPHIA, PA.

SALES OFFICE 4701 Woolworth Building, New York, N. Y.

## PRODUCTS:

**Morris-Weston Ball-Bearing Centrifugals**  
**Centrifugal Clarifiers (Resines Process)**  
**Mixers, Conveyors, Elevators**  
**Power Transmission, Gears**  
**Hydraulic Tankage Presses.**

## CENTRIFUGALS:

Centrifugals are made in sizes of 48", 40", 36", 30". Mounted singly or in batteries for use in chemical plants and sugar factories. Mixers and framing to suit any requirements.



**BATTERY OF 6 40-INCH MORRIS-WESTON CENTRIFUGALS**

## CENTRIFUGAL CLARIFIER:

Separates solids held in suspension in liquids. Eliminates excessive tank capacity because sedimentation is continuous and instantaneous.

Force 500 to 600 times that of gravity.  
 Uses no filter cloths, either fabric or metal.  
 Cannot become clogged.  
 Exempt from pressure pump troubles.  
 Results easily controlled.



**CENTRIFUGAL CLARIFIER**  
**Resines Process (Patented)**

**For Sugar Factories**—Cleans raw sugar juice.

Removes bagacillo and all mineral bodies held in suspension.

Prevents deterioration of sugars.

Increases sugar recovery.

Reduces purity of final molasses.

Hastens concentration in Effects and Vacuum Pans.

Permits liquidation of factory within few minutes after mill ceases to grind.

Removes large percentage of impurities which are insoluble while juice is cold but which become soluble when heated. The elimination of all excess lime, other mineral salts and earthy matter from the juice while they are in suspension permits the crystallization of a greater percentage of contained sucrose.

Number of filter presses reduced 75%, as they handle albumenoids only. Filter presses can be entirely eliminated by passing juice a second time through the clarifier after being heated.

Process does not interfere with any existing methods. The more modern the milling plant and the greater the extraction of sucrose, the greater will be the saving.

*Continued on Next Page*

### DIRECT ELECTRICALLY DRIVEN CENTRIFUGALS

Quick acceleration and short cycle



40" x 24" DIRECT ELECTRICALLY DRIVEN CENTRIFUGAL

*No belts to give trouble.*

Made in 40" and 48" sizes both standard and self discharging baskets

Motor has two speeds with interlocking switch and brake

An ideal machine for drying sugar in refineries, first sugars in raw sugar factories, salt and chemical works.

### WATER DRIVEN CENTRIFUGALS

Fast or slow acceleration Variable speed.

Ideal for chemical or salt works, also sugar factories where variable acceleration and different speeds are required

Power to operate derived from pump, using same water over and over with slight make up.

*No belts or wires to give trouble in Corrosive Atmosphere.*

Made in 40" and 48" sizes with both standard and self discharging baskets



40" x 24" WATER DRIVEN CENTRIFUGAL

# CROWELL MANUFACTURING COMPANY

Sole Manufacturers, Under Patents, of

## Crowell Rotary Air Compressors, Pressure Blowers and Vacuum Pumps

319-321 Franklin Avenue  
BROOKLYN, N. Y., U. S. A.

### PRODUCTS

Sole manufacturers under Patents of Crowell Rotary Air Compressors, Pressure Blowers, and vacuum Pumps for all Kinds of Laboratory Work, Chemical and Steam Heating Plants, Gas or Oil Furnaces, Blow Pipes, etc., also Air Receivers.

#### ROTARY COMPRESSOR OR VACUUM PUMP, TYPE "D"

Single-stage pump, designed for working pressure of 25 pounds per sq. in., or vacuum of from 29 to 30 in. (mercury column). It is of simple, positive and durable action, having no valves, springs, gears or unbalanced parts, and requiring no special foundation.

All sizes of the Type "D" Compressors or Vacuum Pumps can also be furnished set up on a special bed plate and connected by silent chain drive with motor as illustrated. These outfits are made up to order only and as per specifications as to motor, etc., and prices will be quoted accordingly.

#### ROTARY VACUUM PUMP, TYPE "O-D"

For use in small laboratories and all other experimental work. Designed for intermittent operation, and specially adapted for vacuum work; can exhaust to a vacuum of from 29½ to 30 in. (mercury column). Fitted in oil immersion box, which makes it leakproof, or can be used without box. Capacity about 2 cu. ft. of free air per minute requiring ¼ h. p. to operate.

TYPE "D" COMPRESSOR OR VACUUM PUMP

TYPE "D" COMPRESSOR OR VACUUM PUMP WITH REGULAR MOTOR DRIVE

TYPE "O-D" PUMP IN OIL IMMERSION BOX

Price (with oil box), \$66.00—(without) \$55.00  
Weight (with oil box), 50 lbs.—(without), 20 lbs.

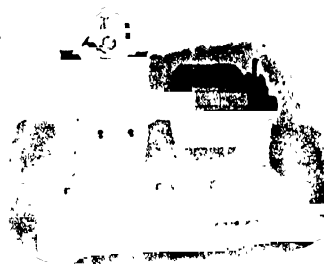
#### POSITIVE PRESSURE BLOWERS, TYPES "A" AND "B"

Adapted for all purposes requiring air under pressure of 1 to 8 pounds per sq. in., or any degree of vacuum not exceeding 20 in.

Construction, same in both types, consisting of an internal drum and shaft carrying sliding blades or pistons operating in close contact with cylinder walls, giving simple positive action. No springs, gears, valves, or unbalanced parts, and pressure not dependent upon high speeds or centrifugal force.



Type "A," sizes from 5 up, fitted with end bearing



Type "B" Positive Pressure Blower

#### DATA, POSITIVE PRESSURE BLOWERS, TYPES "A" AND "B"

General Details Types "A" and "B"							Type "A"		Type "B"			
Size No.	Free Air Capacity		Rev. per Min. at Max. Speed	H. P. Approx. at 3 Pounds Pressure.	Pulleys, Inches	Pipe Size, Inlet and Outlet, Inches	Net Weight, Pounds	Floor Space, Inches	Last Price	Net Weight, Pounds	Floor Space, Inches	Last Price
	Cu. In. per Rev.	Cu. Feet per Min. at Max. Speed										
1	20	6.9	600	1/4	4x1	1/2	24	10 x 6 1/2	\$28.00	42	14x10	\$38.00
2	45	11.0	500	1/2	4x1 1/2	1	34	12 x 6 1/2	36.00	55	16x11	46.00
3	125	25.1	350	3/4	6x2 1/2	1 1/2	98 1/2	22 x 14 1/2	58.00	145	25x20	68.00
4	280	40.5	250	1	9x3	1 1/2	170	34 x 17	75.00	240	30x23	85.00
5	460	53.2	200	1 1/2	10x3	2	225	34 x 20	110.00	330	37x25	125.00
6	690	79.2	200	2	12x4	2	320	38 x 20	150.00	570	41x25	170.00
8	1050	121.5	200	3 1/2	14x6	3	575	48 x 22	210.00	700	50x27	250.00
10	1660	192.0	200	5	18x6	4	770	54 x 28	280.00	1050	56x33	345.00
12	3390	392.0	200	7	20x6	4	1300	64 x 31	480.00	1770	62x36	545.00

#### DATA, TYPE "D" ROTARY COMPRESSOR OR VACUUM PUMP

Size No.	Free Air Capacity		Rev. per Min. at Max. Speed	Approx. H. P. at 15 Pounds Pressure or 29 In. of Vacuum	Pulleys Tight and Loose, Ins.	Approx. Net Weight, Pounds	Pipe Size, Inlet and Outlet, Ins.	Floor Space, Ins.	Last Price
	Cu. In. per Rev.	Cu. Feet per Min.							
1-D	16	4.3	500	1/4	6x2	70	1 1/2	13x18	\$78.00
2-D	40	9.2	400	1/2	8x2	115	1 1/2	14x22	95.00
3-D	100	17.0	300	2	12x4	250	1	19x34	125.00
4-D	280	40.5	250	4	14x4	425	1 1/2	23x38	220.00
5-D	460	46.0	200	6	18x6	580	2	26x44	245.00
6-D	690	69.4	200	8 1/2	18x6	725	2 1/2	26x55	320.00
8-D	1000	115.7	200	9	20x8	1150	2 1/2	30x64	440.00
10-D	1650	190.9	200	12	22x10	1675	3	36x70	660.00
12-D	3390	392.0	200	20	24x10	2150	4	38x76	1000.00



# CRUSE-KEMPER COMPANY

Engineers, Contractors, Manufacturers

WORKS AND OFFICE

AMBLER, PENNSYLVANIA

## PRODUCTS

Gas Holders, for storage of gases. Multiple and single lift.

Steel Plate Structures, of every description.

Tanks, for storage, mixing and treatment of water, oils, acids, etc.

Bins, for storage of lime, ores, coal, ashes, etc.

Purifiers, wet and dry types.

Chutes and Conveyors, for handling any material.

Furnaces, plain and water-jacketed.

Kettles

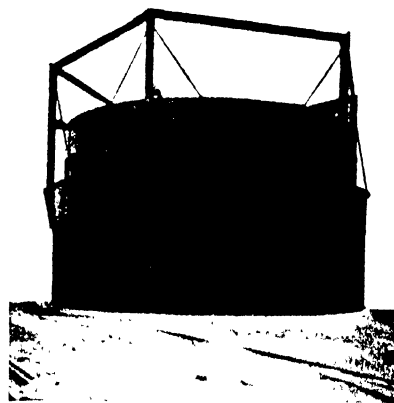
Hoppers

Flumes

Stacks

Flues

Stills



**SINGLE LIFT GAS HOLDER**

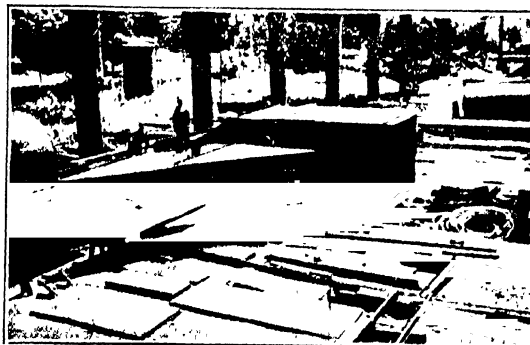
11 feet diameter, 12 feet deep, in steel tank 31 feet diameter, 12 feet 4 inches deep. Capacity, 10,000 cubic feet. Made 500 to 100,000 cubic feet. Multiple lift holders for 75,000 to 5,000,000 cubic feet.

## GAS HOLDERS

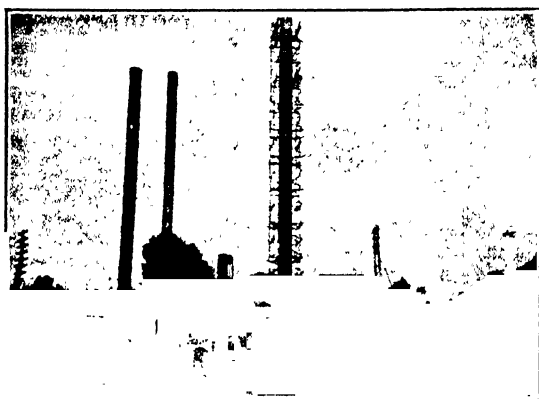
In the construction of our gas holders every inch is caulked, metal to metal, gas tight, as assembled. Furthermore, they stay tight.

## STEEL PLATE CONSTRUCTION

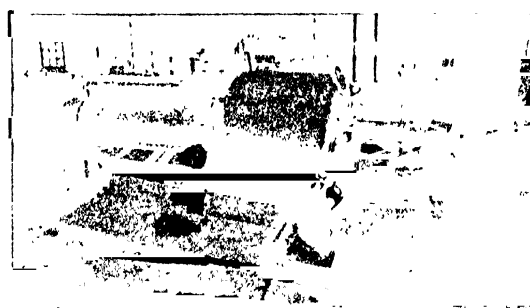
This Company designs, fabricates and erects any type of structure of steel plate, or works to customer's designs. The illustrations below show erection in progress in Porto Rico and work in our yard - a boiler breeching, oil tanks and buoy for the Government, and chemical settling pans.



**BOILER BREECHING**



**ERECTION IN PROGRESS IN PORTO RICO**



**OIL TANKS, CHEMICAL SETTLING PANS, AND A BUOY BUILT FOR THE GOVERNMENT**

# ALPHONS CUSTODIS CHIMNEY CONSTRUCTION CO.

Designers and Builders of Radial Brick Chimneys

95 NASSAU STREET, NEW YORK, N. Y.

Chicago, Ill., Marquette Building  
Boston, Mass., 51 Ellery Street  
Detroit, Mich., Moffat Building  
Pittsburgh, Pa., Empire Building  
Philadelphia, Pa., Pennsylvania Bldg

BRANCH OFFICES  
Seattle, Wash., Colman Building  
Atlanta, Ga., Henley Building  
Richmond, Va., American National Bank Bldg  
Cleveland, O., Guardian Building

Milwaukee, Wis., 641 Wells Building  
Baltimore, Md., 521 Equitable Building  
Toronto, Ont., Canada, Kent Building  
Montreal, P. Q., Canada, 10 Cathcart Street  
Portland, Ore., 222 Pine Street

## PRODUCTS

Designers and Builders of Perforated Radial Brick Chimneys, with Foundation and Flues, of all sizes, for chemical industrial plants, smelters, paint works, furnaces, boilers, crematories, ovens; acid proof chimneys, high temperature chimneys for destructors and incinerators. Chimneys for melting crucibles and blast furnaces, and specially designed chimneys to resist all kinds of acids.

Builders and Designers of the Tallest and Largest Chimney in the World.

ANACONDA COPPER MINING CO., Anaconda, Montana. Height, 585' above grade. Top diameter inside, 60'.

## SERVICES

Specifications, plans, designs and data furnished free upon request.

The Alphons Custodis Chimney Construction Co., through its forty years of experience, is equipped to give expert advice as to the size, shape and design of any kind of a chimney for any purpose. It is particularly competent in designing acid proof chimneys to resist the action of acids.

Every chimney is designed for the particular service expected of it. Different kinds of acids, concentrated, diluted, wet or dry, and all different chemical combinations require special designs to meet each particular case.

If you will state the conditions, the nature of the acids and the results desired, the Engineers of this Company will promptly give the correct, efficient and economical size and design of chimney, not from theoretical tables, but from forty years' experience and unpublished data collected from actual working conditions of our chimneys all over the world.

In the case of chimneys for Boilers, the coal used, temperatures, gases generated, geographical location and many other conditions affect the determination of the most economical and efficient size and design of a chimney.

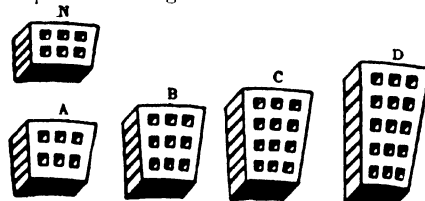
Tell us your conditions and we will make recommendations.

The fact that over 10,000 Custodis Radial Brick chimneys are now in successful operation is sufficient proof of their permanency, efficiency and economy.

## DESCRIPTION

The perforated radial blocks are made only from the purest clays, selected for high refractory powers and high crushing strength and the resistance of acid. Special attention is given in our brick yards to making the proper mix of clays in the right proportion to produce a radial chimney brick which will resist heat strains, as well as strains from weight and wind.

All the radial blocks are formed to suit the circular and radial lines of each part of the chimney, so that they can be laid with thin, even joints and produce a regular smooth surface.



PERFORATED RADIAL BLOCKS

Manufactured in sizes and shapes suitable for all chimney diameters

The blocks are larger than common brick, making the number of mortar joints in a radial brick chimney one-third of those in a common brick chimney of the same size.

Molded with vertical perforations, as shown in the illustration, the radial blocks are most thoroughly and uniformly burned, increasing, to a marked degree, their density and strength. The perforations form a dead air space around the chimney, insulating the hot column of rising gases on the inside from sudden changes of temperatures of the outer air, resulting in a maximum draft under all conditions.

## INFORMATION REQUIRED

When requesting estimates, please give the following information:

Name of place where chimney is to be erected.

On what railroad siding located.

Distance from siding to chimney site

Is chimney to be used for boiler draft or other purposes

If required to handle acids, state nature of acids and whether wet or dry, diluted or concentrated

Give probable temperatures of the flue gases

If for boiler draft, what is total horsepower

Kind of fuel or coal to be used

Amount consumed per horsepower or total per hour

Dimensions of chimney required—diameter, height

Is arrangement for overhead or underground flue

Give dimensions and shape of flue opening desired in chimney

Give height above or below foundation top

Nature of soil where chimney will stand.

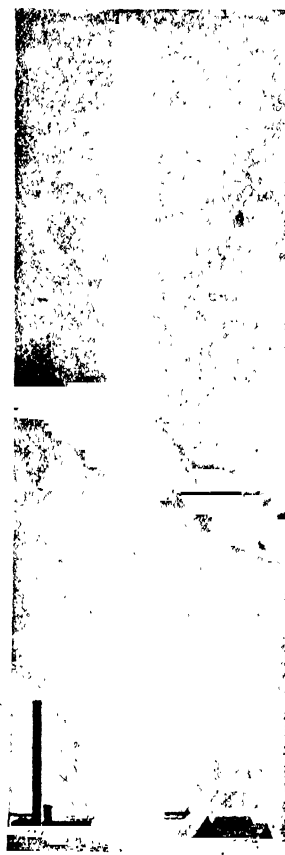
Estimated safe load per square foot

Depth of excavation necessary to reach good soil

Latest date allowed for erection of chimney

Sketch showing arrangement of building, boiler and chimney.

Local prices—red brick, lime, cement and sand.



"ACID PROOF CHIMNEY"

Built for the Heller & Merz Company, Newark, N. J.  
350' high x 8'0" inside diameter  
at the top Built in 1904

## D & W FUSE WORKS

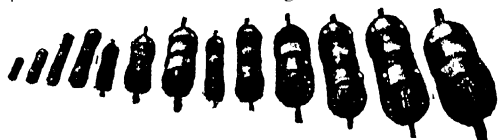
OF GENERAL ELECTRIC COMPANY  
Fuses and Wiring Supplies  
PROVIDENCE, R. I.

### PRODUCTS

D & W Fuses; Fuse Accessories; Oil Fuse Cut-outs; Deltabeston Asbestos Insulated Wires; Insulating Tape and Sheeting.

### D & W FUSES

The manufacturers of D & W fuses have incorporated the soundest engineering principles in the design of each individual fuse, and the closest attention is given to all details in manufacture. The result is a fuse that is accurate in operation and that protects equipment under the most exacting conditions. D & W fuses range in size from 1 to 1000 amperes for all standard voltages.



D & W FUSES ARRANGED FROM 3 TO 1000 AMP. CAPACITY

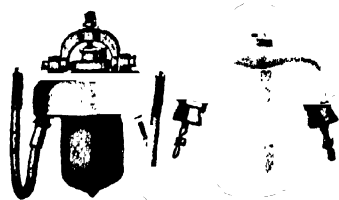
### FUSE ACCESSORIES

D & W fuse accessories include enclosed fuse cut-outs, cut-out bases, fuse boxes, fuse links and clips, service switches, telephone and telegraph protectors, etc. The same quality of workmanship and material enters into these devices as is found in D & W fuses and other products.

Further information is given in Catalog No. 15, mailed on request.

### OIL FUSE CUT-OUTS

Oil fuse cut-outs are designed to protect all classes of circuits and are especially desirable for junction and primary protection near the source of current. They are made in four types—standard and heavy service pole types and standard and heavy service subway types. Heavy service types have increased interrupting capacities over the standard service types. The pole types, designed for overhead circuits, range in size from 50 to 300 amperes at 2200 volts and up to 13,200 volts in smaller sizes. The subway types have the same ratings, and are especially protected against the entrance of moisture and water. This type performs satisfactorily even when totally submerged in water for days. Both types permit fuses to be renewed with ease and safety. D & W oil fuse cut-outs combine accurate overload protection with high interrupting capacity.



Subway Type Pole Type  
50-200 AMPERE OIL FUSE CUT-OUTS

### WIRES AND CABLES

Deltabeston Wires are asbestos insulated. Hence any form or variety will give practically permanent service when subjected to heat. After the insulation has been applied to the wire, in all except two types, the asbestos is filled with a waterproof compound which renders the finished product vaporproof as well as heatproof. Furthermore, experience has demon-

strated that Deltabeston Wire will withstand also many chemical fumes and therefore is of particular importance to the chemical industry. Detailed information now available will be sent gladly to any manufacturer.

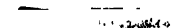
Deltabeston Magnet Wire is used chiefly for winding coils in motors which run hot either because they are overloaded or because of their location with reference to external heat. Moreover, in many instances motor coils break down because of

chemical action on the insulation of the Magnet Wire and while Deltabeston Magnet Wires cannot be guaranteed to withstand every known fume, there are very many applications for this wire in the chemical field. The insulation consists of asbestos fiber applied to the wire in a felted form and then impregnated. This insulation is of approximately the same wall thickness as double cotton covered magnet wire. Deltabeston Magnet Wire can be furnished round in sizes from No. 0 to No. 20 inclusive, rectangular and square.



Deltabeston Heater Cord is furnished either with a cotton braid over the felted insulation of the two conductors or with an impregnated asbestos braid. The latter form of heater cord is known as type A. Cord and is more suitable for use in the chemical industry. This is due to the filled outer asbestos braid which resists abrasion and is heat and moisture proof.

Deltabeston Miscellaneous Wires serve a variety of purposes wherever heat is a factor in a wiring installation. Like Deltabeston Magnet Wire the insulation consists of felted asbestos, the only difference being in the wall thickness. The insulation is from .027 to .030 in. or approximately 1/32 in. thick.



Deltabeston Motion Picture Cable is a very flexible, stranded conductor finished with a filled asbestos braid. It is of service where flexibility and resistance to heat are important factors. It is used for wiring on cranes, controllers and search-lights as well as Motion Picture apparatus.

This Company manufactures also Stove Wire, used chiefly for wiring electric stoves and ranges; Switchboard Wire, of practically the same construction; and Fixture Wire, used in connection with the wiring of lighting fixtures.

### INSULATING MATERIALS

Deltatape is a high heat resisting material having asbestos fiber as a base. Its thinness and flexibility make it especially applicable on covers and terminals of coils and between turns of flat wound motor coils. It can be furnished in any thickness from 10 to 25 mils., widths ranging from 1/4 to 1 1/2 in.

Delta sheeting is the same in properties, texture, and finish as Deltatape. Furnished in rolls of any convenient length, the standard width being 8 in.

Established 27 Years

**A. DAIGGER & COMPANY**Exporters, Importers, Manufacturers and Dealers  
Laboratory Supplies and Chemicals54-60 West Kinzie Street  
CHICAGO, ILLINOIS**PRODUCTS****LABORATORY SUPPLY DEPARTMENT****SPECIALTIES**

Hydrometers  
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 Special Designs of Apparatus in Glass, Metal,  
 Rubber, Fiber or Wood  
 Balance Repairs  
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**TESTING INSTRUMENTS**

Asphalt (Penetrometers, etc.)  
 Bacteriology (Bio-Chemical)  
 Calorimeters (Bomb Types)  
 Cement (Molds, Needles, etc.)  
 Color Testing (Tintometers)  
 Dissecting (Surgical, etc.)  
 Electro-Chemical (Cathodes and Anodes)  
 Filter Paper  
 Gas Analysis (Burettes, Pipettes)  
 Hæmatology (Hemacytometers)  
 Incubators (Electrical, Gas or Oil)  
 Leather (Complete Installations)  
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 Nitrogen Equipment (Digestion shelves)

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Write for descriptive catalog; new edition published  
 and now ready for distribution.

**REPRESENTATIVE STOCK CARRIED IN**

J. T. Baker's Analyzed  
 Baker & Adamson's  
 Merck's Reagents  
 Commercial and Industrial Chemicals  
 Balances and Weights  
 Platinum Ware—Any Shape

**AMERICAN GLASSWARE AND PORCELAIN-WARE****CHEMICAL DEPARTMENT**

(INDUSTRIAL CHEMICALS)

Our connections all over the United States and foreign countries enable us to meet competition and give satisfactory service.

We specialize in supplying the following industries from stocks carried in Chicago as well as for shipments from other plants:

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 Dry Color Manufacturers  
 Disinfectant Manufacturers  
 Dyers and Bleachers  
 Enamelers, etc.  
 Ink Manufacturers  
 Glue and Paste Manufacturers  
 Packers  
 Paint Manufacturers  
 Paper Manufacturers  
 Perfumers  
 Rubber Manufacturers  
 Shoe Polish Manufacturers  
 Smelters and Refiners  
 Soapmakers  
 Tanners  
 Textile Mills  
 Varnish Manufacturers  
 Wall Paper Mills

Ask for our Heavy Chemical Catalog

Your inquiries are solicited.

We sell Technical and Chemically Pure Materials  
 of all kinds in Quantities from One Gram to Carloads.

## D & W FUSE WORKS

OF GENERAL ELECTRIC COMPANY  
Fuses and Wiring Supplies  
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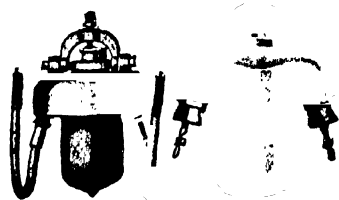
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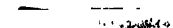
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Delta sheeting is the same in properties, texture, and finish as Deltatape. Furnished in rolls of any convenient length, the standard width being 8 in.

ESTABLISHED 1875

# G. M. DAVIS REGULATOR CO., Inc.

## Manufacturers of Davis Valve Specialties for Chemical Industries

425 Milwaukee Ave., CHICAGO, ILL.

Branches in all principal cities

### PRODUCTS

Pressure Regulators, Stop and Check Valves, Exhaust Relief Valves, Back Pressure Valves, Balanced Valves, Float Valves, Steam Traps and other Steam Specialties.

#### BALANCED VALVES

Designed for working pressures up to 200 pounds. Can be used with steam, air, gas or water. Well adapted for feed-water heaters, condensation tanks, hot wells, and for all purposes requiring a valve which is not affected by internal pressure. Sizes  $\frac{1}{2}$  to 14 inches.



**BALANCED VALVE**  
Screwed or flanged ends

**BACK PRESSURE VALVE**  
Screwed or flanged ends

#### BACK PRESSURE VALVES

Maintain any desired back pressure in an exhaust steam line. Double piston type valve. Will not stick or bind, and is noiseless in operation. Sensitive and accurate. Sizes 2 to 30 inches.

#### STOP AND CHECK VALVES

For preventing reverse flow of steam. Made with oil dash-pot; absolutely reliable. For any working pressure up to 350 pounds and any temperatures up to 800° F. Sizes 2 to 12 inches.



**STOP AND CHECK VALVE**  
Globe or angle pattern

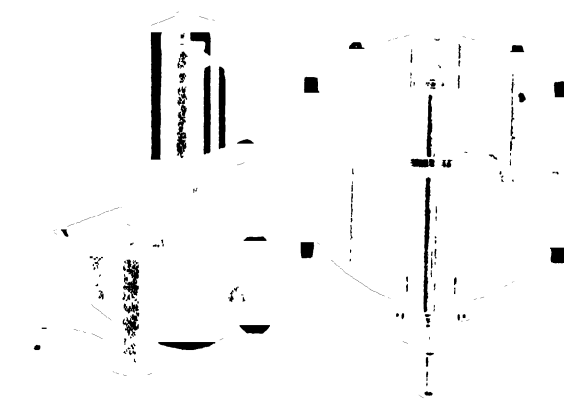
**FLOAT VALVE**  
Screwed or flanged ends

#### FLOAT VALVES

For automatically controlling water supply to tank, or reservoir. Keeps water at constant level. Single seat with renewable composition disc makes it close tight without leakage. Sizes  $\frac{1}{2}$  to 14 inches.

#### PRESSURE REGULATORS

For high or low pressures; steam, air or water. Automatically reduces from any operating pressure to any lower pressure. Equipped with oil dash-pot, which insures steady operation. Sizes  $\frac{1}{2}$  to 14 inches.



**PRESSURE REGULATOR**  
Screwed or flanged ends

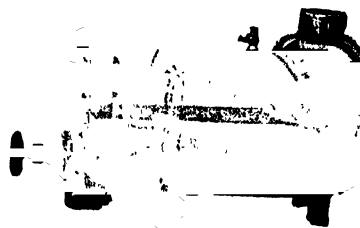
**EXHAUST RELIEF VALVE**  
Flanged ends only

#### EXHAUST RELIEF VALVES

Protect condenser equipment from damage by pressure. Full pipe opening. Equipped with dash-pot, which makes the operation steady and noiseless. Made in either horizontal or vertical types. Sizes 6 to 48 inches.

#### IMPROVED STEAM TRAP

Automatically removes water of condensation from steam pipes without loss of steam. Discharges continuously under any pressure and against any lower pressure. Double-cone-shaped balanced valves. Water-sealed to prevent steam leakage.



**IMPROVED STEAM TRAP**

#### LITERATURE

These are a few of the Davis Valve Specialties more widely used in the chemical industries. There is a "Davis" designed especially for every duty. They are all completely illustrated and explained in the new Davis Catalog. Write for your free copy to the G. M. Davis Regulator Co., 425 Milwaukee Ave., Chicago.

# THE J. H. DAY COMPANY

FACTORY AND MAIN OFFICE  
1141 HARRISON AVENUE, CINCINNATI, OHIO

New York      Boston      Philadelphia      BRANCHES      Buffalo      Chicago      Kansas City      San Francisco

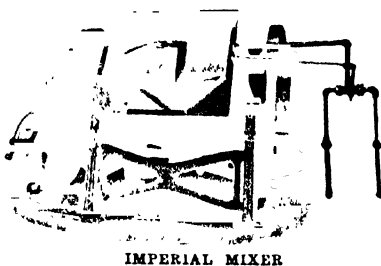
## PRODUCTS

Mixers, Kneaders, Grinders, Sifters, Blenders, Emulsifiers, Disintegrators, Package Fillers, Kettles, Racks, Trucks, Tanks and Special apparatus for handling Dry, Liquid, Powder, Granular, Dough and Paste Materials. Made water-cooled or jacketed and with Galvanized or Enameled Tanks when required.

## DAY

### IMPERIAL MIXER

For heavy plastic materials. With or without Steam Jackets. 4 sizes. Capacity, 50, 70, 110, 220 gals.



IMPERIAL MIXER

### THREE-ROLL PIGMENT AND PASTE MILL

For Paints, Printing Ink, Chocolate.

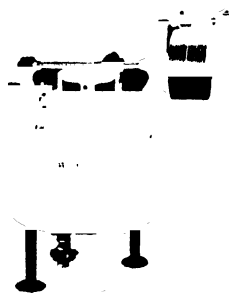
Rolls: 5" x 12", 12" x 32", 16" x 28", 16" x 40".



PIGMENT AND PASTE MILL

### STEAM JACKETED KETTLES AND MIXERS

For cooking and heating materials that require constant stirring. Variation in agitators can be made to suit requirements. 10 sizes. Capacity, 20 to 1000 gals.



STEAM JACKETED KETTLE

### PLAIN AND JACKETED MIXING MACHINES

For all grades of material used by Rubber Manufacturers, by Manufacturers of Explosives, and in all lines where mixing is done. Capacities from 10 lbs. to 10 tons.



MIXING MACHINE

### HANCE CONICAL PLATE DRUG MILLS

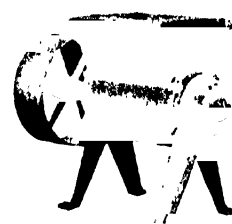
Made in two sizes; adjustable for different fineness. For hand power or pulley drive. The only Mill that can be cleaned quickly.



DRUG MILL

### DAY HERCULES CRUSHER

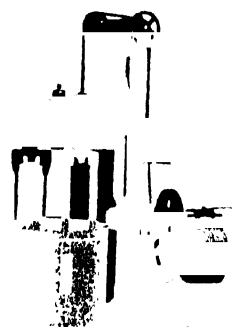
For Filter Press Cakes, Clays, Chemicals and all materials required crushing before being pulverized. Has large capacity.



HERCULES CRUSHER

### DAY BRIGHTON MIXER

20, 80 and 175-gallon capacity. Rapid mixing of all kinds of paste preparations.



BRIGHTON MIXER

### SIFTERS AND MIXERS

For all powdered and granular materials. Capacities, 10 lbs. to 5,000 lbs. With steam jacket when desired.



SIFTER AND MIXER

### DAY LIGHTNING DISINTEGRATOR

Made in three sizes; for coarse, medium or fine grinding; suitable for grinding filter press cakes, clay, cork, glue, resin, roots, barks, etc.



DISINTEGRATOR

WRITE FOR OUR CATALOGS

# JULIAN D'ESTE COMPANY

Cable Address  
"HULL", Boston

Manufacturers of Steam Specialties  
Engineers, Machinists and Brass Founders

26 CANAL ST., BOSTON, 11, MASS.

## AGENCIES

New York, N. Y., 180 Washington Street

Chicago, Ill., 171 N. Market Street

FACTORY Charlestown, Mass.

## PRODUCTS

Curtis Engineering Specialties, which include:  
Regulators; Damper, Temperature, Water, Air,  
Steam, Pumps and Steering Engine.

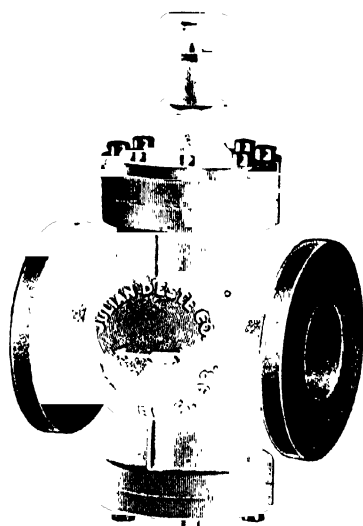
Steam Traps; Balanced, Return, Expansion and  
Bucket.

Balanced Valves, Steam Separators and Ballcocks.

### IMPROVED STEAM PRESSURE REGULATOR

Made entirely of metal, a lock valve and very sensitive. It has no levers, weights, projections, glands or packing. There is no drip or leak of steam or water and all that passes into it passes through it. Suitable for boiler pressure up to 200 lbs.

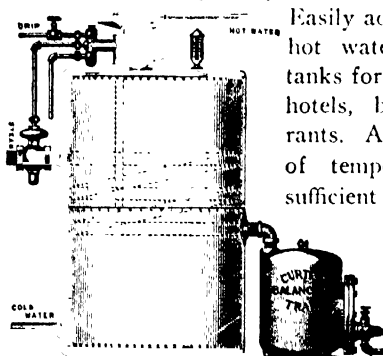
Sizes:  $\frac{1}{2}$ "-1 $\frac{1}{2}$ "—all bronze, screwed ends. 2" screwed ends. Iron body with bronze mountings. 2 $\frac{1}{2}$ "-12" flanged ends. Iron body with bronze mountings.



IMPROVED STEAM PRESSURE REGULATOR

### CURTIS TEMPERATURE REGULATOR

Will control any temperature 0.0° F. to 300° F.



CURTIS TEMPERATURE REGULATOR

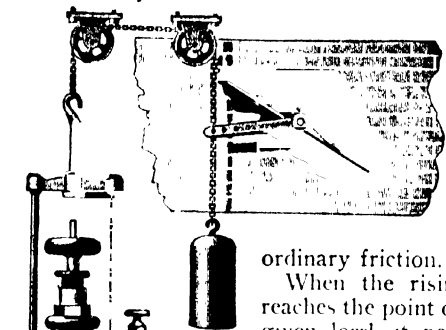
Easily adapted to steam or hot water boilers, or to tanks for heating water for hotels, baths, or restaurants. A minimum change of temperature produces sufficient movement to do

the work. Power is unlimited.

Sizes:  $\frac{1}{2}$ " to 8" inclusive.

### IMPROVED DAMPER REGULATOR

The Regulator is actuated by steam pressure and consists of a gunmetal cylinder, within which is a piston fitted with water packing. The piston rod is connected by a chain to the lever of the damper, on



which hangs a weight sufficient to overhaul the piston and open the damper, regardless of any

ordinary friction. When the rising pressure reaches the point of lifting the given load, it permits steam to enter the space over the piston, which slowly pushes it down and closes the damper. Falling pressure at length closes the valve, pressure then passing from top to bottom of the piston, which allows the weight to settle and open the damper.

This Regulator is guaranteed to change the damper in either direction on a minimum variation of pressure. It is also guaranteed a fuel saver over the vast hand regulation.

Sizes:

No. 1 up to 40" diam. damper  
No. 2 " 60" " "  
No. 3 " 72" " "

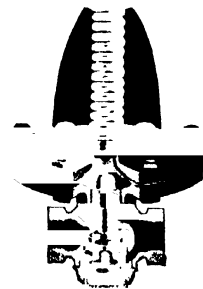
IMPROVED DAMPER REGULATOR

### CURTIS WATER PRESSURE REGULATOR

For pulp and paper mills, hotels, public buildings and residences.

Warranted to maintain the pressure desired with perfect uniformity, in spite of any and all fluctuations in the outside pressure. This Regulator obviates the wear and tear caused by water hammer and high pressure on all plumbing fixtures and fittings.

Sizes:  $\frac{1}{2}$ " to 12" inclusive.



CURTIS WATER PRESSURE REGULATOR



# THE WELDED STEEL BARREL CORPORATION

Successors to  
THE DETROIT HEATING & LIGHTING CO.  
Manufacturers of

Detroit Combination Gas Machine with Automatic Mixing Regulator  
DETROIT, MICH.

Established 1868

**PRODUCTS:** Combination gas machine with automatic mixing regulators, fuel gas plants, laboratory burners, blast burners, tinner's gas fire pots, etc.

**THE DETROIT COMBINATION GAS MACHINE AUTOMATICALLY MAKES GAS FOR LABORATORY AND INDUSTRIAL USES OF EVERY CHARACTER.**

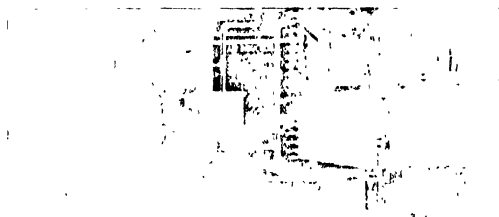
(OVER 40,000 IN DAILY USE)

Entered in ("Class A") the highest class by the National Board of Fire Underwriters.

Not a drop of gasoline brought into the buildings—it is all stored and generated in outside underground carburetor.

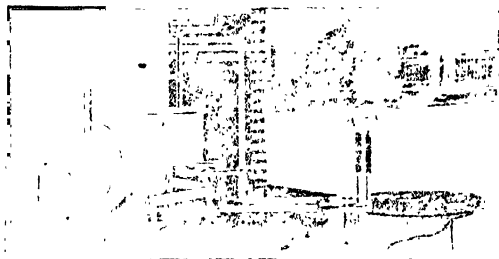
## DESCRIPTION:

This is a very simple machine, comprising an Air Blower (either in the Weight or Water Driven Type), an Automatic Mixing Regulator which is usually located in the basement of the building, and a Carburetor or Generator which also serves as a Storage Tank, and is usually located about 30 feet from the building and buried underground.



WEIGHT DRIVEN TYPE

This Plant uses Gasoline as fuel. By observing the illustrations of the machine you will notice the Air Blower, which is either Weight Driven or Water Driven, takes air from outside and forces it through the Carburetor or Generator where it passes over the surface of the gasoline in the various Cells, two, three or more, depending upon capacity of machine—the gasoline exposed to the air vaporizes in the form of gas and is returned to the Combination Mixing Regulator, where it is diluted with air and delivered to the burners in a fixed quality.



WATER DRIVEN TYPE

The Weight and Water Driven Machine differs only in respect to Air Blower. The Weight Type requires an occasional winding, the Water Driven requires no attention at all—it is automatic.

## THE COMBINATION MIXING REGULATOR APPLYING NATURE'S LAW OF BUOYANCY:

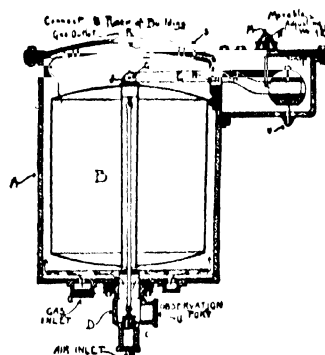
This law is applied in a very simple way in the Detroit Combination Mixing Regulator, a device fully covered by patents—AN EXCLUSIVE FEATURE ON COMBINATION GAS MACHINES. The Regulator consists of a substantial cast iron case (A in the illustration) with the opening (P) at the bottom to let in air, and another opening at the top (R) to let out the gas. Inside of this case is a cylindrical vessel (B), which is filled with air and is sealed air tight. This vessel is suspended from one end of a beam (E), on the other end of which is a weight (F), which exactly counterbalances the vessel. The balance beam, with the vessel and weight, is placed on the agate bearing (K), and as they exactly balance each other, their weight can be disregarded.

That's a very simple arrangement, isn't it? Now, how does the law of buoyancy operate it? When the iron case becomes filled with a gas heavier than air, the vessel (B) inside will rise, just as the balloon rises in the heavier atmosphere, for the air in the vessel is lighter, volume for volume, than the heavier gas which surrounds it.

The gas which enters the case comes from the carburetor through the gas inlet (Q) in the bottom. This gas is charged with gasoline vapor and of course is heavier than air not so charged. The fresher the gasoline the more vapor will be absorbed by air passing over it. If this rich gas is allowed to reach the burners it will cause dense smoke and a disagreeable odor. The gas at the burners must be about 85% air and 15% gasoline vapor. Those proportions are permanent, as the Combination Mixing Regulator is permanently set when installed to mix about 85% air and 15% gasoline vapor.

When the heavy gas comes into the case, the inner vessel filled with air immediately rises, bringing with it the valve C, which admits uncharged air through the inlet P. This at once reduces the richness of the gas and brings it to the quality for which the mixer is set. The result is a gas of perfect mixture, producing the highest efficiency for every purpose where public gas would be used and at no greater cost.

These plants when shipped are all set up ready to connect to the piping, so that any man having tools for cutting and threading pipe can make the installation very easily by simply following the printed instructions which accompany plant.



Combination Automatic Mixing Regulator

## CAPACITIES AND SHIPPING WEIGHTS

Capacity Number of Burners or Lights	Diameter Carburetor Fit	Shipping Weight: Either Weight or Water Driven Type
15—	66"	930
20—	75"	1110
30—	78"	1185
40—	84"	1460
50—	90"	1520
75—	96"	2125
100—	102"	2715
150—	108"	3250
200—	114"	3425
300—	126"	4500
500—	132"	5250

Prices quoted upon application.

## "DETROIT" LABORATORY BURNER:

The "DETROIT" Laboratory Burner has come into universal use for Laboratory work of nearly every character. The separate control of both Air and Gas offers a wide range of temperatures with the greatest ease. Constructed of all brass except the base, which is iron and neatly japanned.

PRICES: Lots of less than one dozen \$1.25 each  
Lots of one dozen 10% Discount  
Lots of 12 dozen 20% Discount

"Detroit" Laboratory Bunsen Burner

# DETROIT RANGE BOILER & STEEL BARREL CO.

Manufacturers of "Perfect" Metal Bilge Barrels and Detroit Drums  
DETROIT, MICH.

BRANCHES  
New York 39 Church St. St. Louis 706 Security Bldg.  
Chicago 642 McCormick Bldg. Philadelphia 4802 Springfield Ave.  
San Francisco 68 Post St.

MAIN OFFICE  
2475 24th Street  
Detroit, Mich.

PLANTS  
Detroit, Michigan  
Toledo, Ohio

## PRODUCTS

"Perfect" Metal Bilge Barrels  
"Detroit" Drums

### "PERFECT" METAL BILGE BARREL

The production of steel barrels in the bilge shape is the one outstanding improvement in metal containers since their inception.

The Bilge Shape gives greater strength and durability. It is also responsible for the easier handling qualities of this type of package.

Representative users of **Perfect** Metal Bilge Barrels who formerly used wood barrels have reported savings, since they started shipping in **Perfect** Barrels of from sixty cents to three dollars per barrel of their product shipped. Think what it would mean in your business to save even fifty cents, or one dollar on every barrel of your product that you ship. These reports are available to anyone who cares to write for them.

**Guarantee**—So great is the faith of the maker that all

**Perfect** Metal Bilge Barrels are guaranteed for three years from the date of shipment. We agree to repair or replace, free of charge, f.o.b. Detroit, any **Perfect** Barrel returned to us within three years of date of shipment, which shows under ordinary usage any defect in material or workmanship.

**Perfect** Barrels are further guaranteed as follows: That every barrel is tight under 15 lbs. air pressure and will withstand a hydraulic pressure of 45 lbs. without permanent deformation; that every Barrel will meet the requirements of the Interstate Commerce Commission Specifications No. 5.

## SPECIFICATIONS

**Material**—Finest open hearth steel—12, 13 and 14 gauge—made to a special formula to secure uniformity of thickness and quality throughout.

**Dimensions**—30 gallon: 29 inches high, 17 inches diameter at chime, 20 inches diameter at bilge.  
55 gallon: 33 inches high, 20½ inches diameter at chime, 24½ inches diameter at bilge.

**Chime**—The vital point in a steel barrel is its chime. It is upon the chime that the hardest blows fall and the greatest strain comes. On it 90% of the drops occur.

We have made the **Perfect** chime many times stronger than absolutely necessary. We could build a barrel for competition and save 10% on our chime construction alone. But



we are making the strongest barrel we can make and our chime is the strongest part of a strong barrel.

**Galvanizing** We use only pure zinc spelter in coating our galvanized Barrels and Drums immersing them in a tank of molten metal. Drums and Barrels are carefully prepared before immersion by scientific pickling process. Our galvanized Barrels and Drums are thoroughly and heavily coated and are absolutely clean on the inside.

**Testing**—Every barrel, before shipment, is twice tested with air to 20 pounds pressure.

### REMOVABLE HEAD BARREL—

**Perfect** Barrels can be supplied with full removable head. This type is ideal for the shipment of powders, solids, semi-solids, pastes and other materials that cannot be put into or taken out of the ordinary package. This package is also well suited to carrying heavy, viscous liquids that make the inside of the ordinary barrel hard to clean.

The heads are absolutely tight. They are equipped with **"PERFECT" METAL BILGE BARREL** handles and secured in position or loosened by a half turn of the lugs.

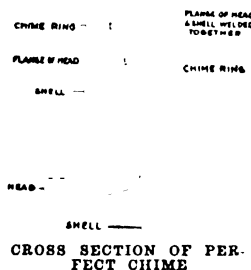
### DETROIT DRUMS

**Detroit Heavy Steel Drums**—Detroit heavy steel drums are made in 55 gallon and 110 gallon capacities. The smaller sizes are made from 14 and 16 gauge material, the large from 14 to 12 gauge material. These drums are equipped with the **Perfect** chime and can be had with 1-Bar or corrugated rolling hoops, in black or galvanized.

**Detroit Light Steel Drums**—Detroit light steel drums are made in 10, 15, 30, 50 and 55 gallon capacities. Up to and including the 30 gallon size the Light Drums are made from 19 gauge material. Fifty and fifty-five gallon sizes are made from 18 gauge material. They can be had painted black or in special colors. Reversible faucets furnished on request.

### CATALOGS

A complete catalog of Barrels and Drums will be sent to any user on request. Given the necessary information we will analyze your shipping problems and give you definite recommendations as to the type of package best suited to your needs.



# DIAMOND STATE FIBRE COMPANY

BRIDGEPORT (NEAR PHILADELPHIA), PA.

OFFICES IN PRINCIPAL CITIES

BRANCH FACTORY AND WAREHOUSE CHICAGO

IN CANADA DIAMOND STATE FIBRE CO. OF CANADA LTD. TORONTO

## PRODUCTS

Producers of Diamond Fibre in sheets, rods and tubes for general manufacturing purposes.

Makers of Trunk Fibre.

Railroad and Signal Insulation.

Disfco Insulation.

Diamond Fibre Receptacles—trucks, roving cans, waste baskets and fibre containers of all kinds.

Diamond-F Protective Papers for wrapping pharmaceuticals, cosmetics, and other specialties.

Condensite-Celoron a waterproof fibre.

## DIAMOND FIBRE

Our basic product is a tough, homogeneous material almost as hard as iron yet lighter than aluminum. It will take any machining process or may be bent and formed. It combines great tensile, compressive, shearing and dielectric strengths. It is made in standard colors, red, gray or black, and supplied in standard sheets, rods and tubes of various standard thickness and size.

## TECHNICAL DATA

**Tensile strength**—Longitudinal 12,200 pounds, transverse 8,100 pounds, to the square inch

**Compressive strength**—Perpendicular to laminations 25,120 lbs., parallel to laminations 9,240 lbs. per square inch

**Shearing strength**— $\frac{1}{8}$  inch fibre 10,920 lbs. per square inch

**Dielectric strength**—Approximately 200 volts per mil

**Specific gravity**—1.38.

**Uses**—Especially adapted for manufacture of electrical and mechanical equipment, machined parts, bushings, gaskets, washers automotive parts, conduits, handles, pulleys, etc.

## CONDENSITE-CELORON

This is a special grade of waterproof fibre designed for use where extreme resistance to water and high dielectric properties are essential. The material is absolutely non-hygroscopic and will not absorb moisture from the atmosphere regardless of the humidity.

**Uses**—Condensite-Celoron is especially recommended for radio and wireless work both as a superior insulating material and for making panels, bases, cleats, conduits, handles and other parts of high grade electrical equipment. It is made in two colors, natural (brown) and black. Supplied in sheets, rods and tubes of standard dimensions.

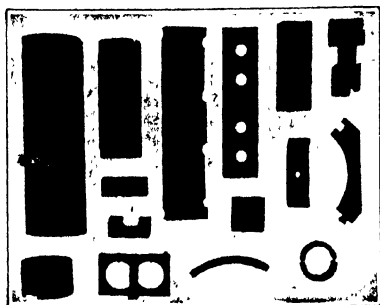
## CONDENSITE-CELORON FOR SILENT GEARS

This particular grade is made especially for silent gear cutting.

It is extremely water-resistant, high in dielectric strength, impervious to oils and most acids, highly resilient and self-supporting. Gears made of it, in standard size, require no shrouds or end plates. It is as strong as cast iron and when properly applied and lubricated will often outlast cast iron or brass gears. It can be used for duties in places and under conditions where the average non-metallic gear would be impossible.

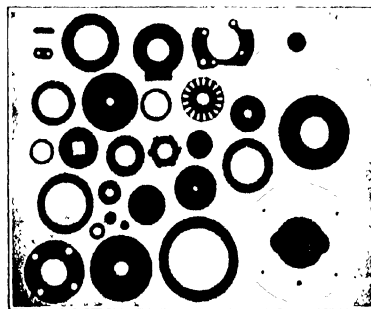
Condensite-Celoron for gears is supplied in standard size sheets 36x36 and 36x40 in any thickness up to and including 3 inches. Write for samples and booklets.

For the convenience of our western customers we maintain complete stocks and machining facilities at our western branch factory and warehouse, Chicago.



DIAMOND FIBRE  
ELECTRICAL PARTS

CONDENSITE-CELORON  
SPUR GEAR



DIAMOND FIBRE DISCS,  
WASHERS AND PUNCHINGS

# J. P. DEVINE COMPANY

MAIN OFFICE AND WORKS

1376 CLINTON ST., BUFFALO, N. Y.

NEW YORK OFFICE: 50 E. 42nd St.

HAVANA

LONDON: James Livingston, Ltd.

## PRODUCTS

Vacuum Chamber Dryers, Steam or Electrically Heated

Vacuum Single and Double Drum Dryers

Atmospheric Single and Double Drum Dryers

Vacuum and Atmospheric Rotary Dryers

Vacuum Drying and Impregnating Apparatus

Vacuum Evaporators, Single and Multiple Effects

Condensers—Surface, Jet and Barometric Types

Vacuum Pumps, Wet and Dry Types

Chemical Apparatus—Kettles, Stills, Columns, Caustic Pots

Extractors, Autoclaves

Solvent-Recovery Apparatus

Grinders.

## VACUUM CHAMBER DRYERS

Used where the material can be spread out on plates or trays. Devine Chambers are made in all sizes and built for steam, hot water heating or electric heating. Materials which are being successfully dried in our Chambers: Dyes, Fruits, Vegetables, Fish, Nuts, Soap, Paste, Rubber, Sugar, Explosives, Fabrics, etc.



VACUUM CHAMBER DRYER

## DRUM DRYERS

Are built in all sizes both vacuum and atmospheric and with Single or Double Drums. They are built for drying liquids containing solids and recover the solid as a finely divided powder.

## THE DOUBLE DRUM DRYER

Drum Dryers

are particularly

designed to han-

dle such sub-

stances as Milk,

Blood Serum,

Glue, Dyes, In-

termediate, Log-

wood Extracts,

Salt Solutions,

and similar ma-

terials.



DRUM DRYER

## ROTARY DRYERS

Are made in all sizes and are either vacuum or atmospheric type, depending on the work to be done. Like the preceding dryer they are steam heated, but they are provided with both an external jacket and an internal heating element. The internal heating element has also a series of blades which tumble the material to be dried. This apparatus is adapted to materials that do not coat the heating surface and can be tumbled without injury, such as Starch, Powdered Coal, Sawdust, Corn, Oats, Distillery Grains, Guano, Artificial Manure, etc.

VACUUM ROTARY DRYER

The operation of the Vacuum Chamber Dryer and the Vacuum Rotary Dryer is of necessity periodic, as the apparatus to guarantee feeding and discharge while maintaining a vacuum is too expensive and complicated to permit its being used successfully. However, the time required for discharging and charging is very small.

The Atmospheric Drum Dryers and Rotary Dryers and the Vacuum Drum Dryers are all continuous and the product can be carefully regulated at all times.

We supply all auxiliaries for the operation of this apparatus, such as Condenser, Catchalls, Dust Filters, etc.

## EVAPORATORS

Built in any number of effects and of every design. We build Evaporators for evaporating all types of liquids or solutions, such as Sugar, Glue, Caustic Liquors, Salt Liquors, Waste Waters, Tannin Extracts, etc. Devine Evaporators are built of any material required by the nature of the liquors, such as iron, steel, copper, etc., or are copper tinned or lead sheathed for any work required.

## VACUUM PANS

Furnished for all varieties of work and to handle all types of material. For the drug, sugar, and food industries.



VACUUM PAN

*Continued on Next Page*

# DIAMOND STATE FIBRE COMPANY

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OFFICES IN PRINCIPAL CITIES

BRANCH FACTORY AND WAREHOUSE CHICAGO

IN CANADA DIAMOND STATE FIBRE CO. OF CANADA LTD. TORONTO

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Diamond-F Protective Papers for wrapping pharmaceuticals, cosmetics, and other specialties.

Condensite-Celoron a waterproof fibre.

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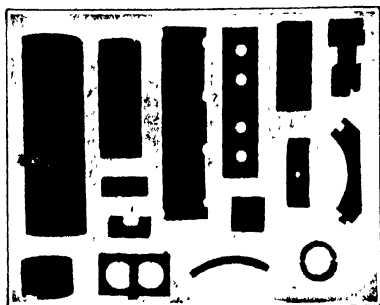
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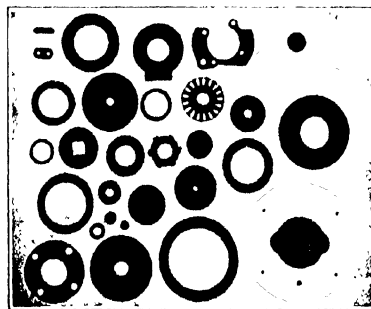
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DIAMOND FIBRE  
ELECTRICAL PARTS

CONDENSITE-CELORON  
SPUR GEAR



DIAMOND FIBRE DISCS,  
WASHERS AND PUNCHINGS

# DINGS MAGNETIC SEPARATOR COMPANY

Dings and Wetherill High Intensity Magnetic Separators

HOME OFFICE AND WORKS

222 SMITH STREET, MILWAUKEE, WIS.

BRANCHES

New York  
52 Vanderbilt Ave

Detroit  
505 Hammond Bldg

Denver  
1718 California St

Richmond  
905 Fourth Ave

## PRODUCTS AND SERVICE

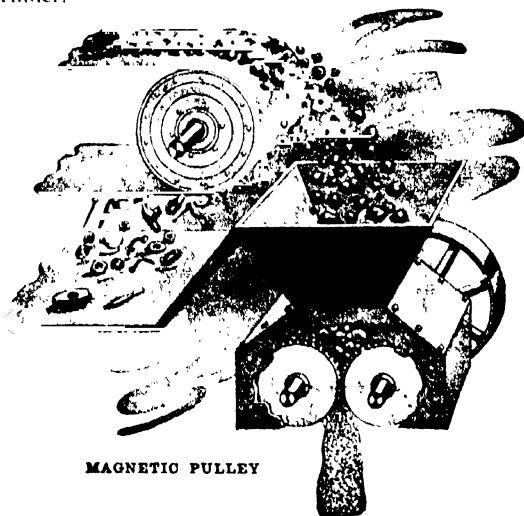
Magnetic Pulleys, Magnetic Separators, High Intensity Magnetic Separators, Magnetic Ore Concentrators, Spout Magnets, Safety Magnets, Metal Separators, Crusher Protectors, Standard and Special Magnets for all Purposes.

Magnetic Separator Service based upon many years' experience in this line. Estimates, sketches, processes, etc., cheerfully furnished.

## MAGNETIC PULLEYS

Dings Magnetic Pulleys are made in all diameters and belt widths and are used in a variety of Industries for Protecting Crushing and Grinding Machinery.

With these Magnetic Pulleys as Head Pulleys in a belt conveyor all Tramp Iron is automatically removed from Conveyed Material before going into Crusher or Grinder.



MAGNETIC PULLEY

Magnetic Pulley Type Separators are very often used for simple Concentrating and Refining Problems.

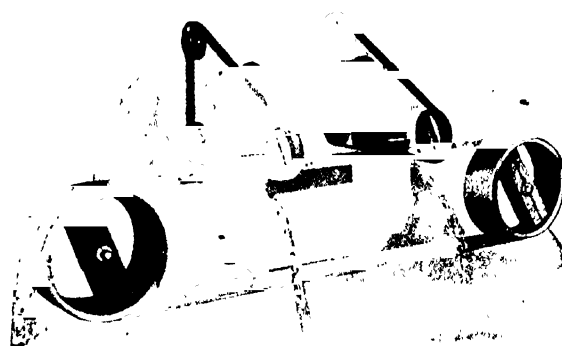
## MAGNETIC SEPARATORS

There is a Standard Type of Dings Magnetic Separator for practically every separation problem encountered in Manufacturing, Mining, Concentrating, Reclaiming and Refining Plants. The following industries have applied Magnetic Separators to the solution of their problems:

Brass, Aluminum, Bronze, Gray Iron, Steel and Malleable Iron Foundries, Brass and Aluminum Smelters and Refiners, Brass and Copper Rolling Mills, Coal Mines and Crushing Plants, Rubber, Abrasive, Garbage and Crucible Reclaimers, Potteries and Fertilizer Plants, Mineral Concentrators of various ferrous minerals.

## MAGNETIC ORE CONCENTRATORS

We manufacture Dings and Wetherill High Intensity Ore Concentrators in both Dry and Wet Types. All



WETHERILL SEPARATORS

ferrous Minerals, whether Oxides, Sulphides or Arsenical, are susceptible to Magnetic Concentration. Such ores as Lead and Zinc Sulphide, Zinc Carbonate, Chromite, Barytes, Hubermite, Marcacite, Stannite, Almandite, Monazite, Wolframite, Hematite, Pyrrhotite, Ilmenite, Zircon, Andradite, Arsenopyrite, Scheelite, Manganese, Cassiterite, Magnetite, Pyrite, Nickel, Garnet, and Chalcopyrite, are particularly susceptible to Magnetic treatment.

## COST PER TON

Because Magnetic Concentration produces such an extremely high recovery the cost per ton of Concentrates is usually considerably lower in a Magnetic Concentration Plant than in any other process.

Recoveries over 98% are not uncommon.

## LABORATORY TESTS

We maintain a Laboratory in Milwaukee for testing materials in order to determine their susceptibility to Magnetic treatment. Samples are separated free of charge, and products returned to customers for analysis and inspection. A five pound sample is sufficient for this test.

## GUARANTY

All Dings Magnetic Separators are guaranteed against Mechanical defects for a period of one year.

## BULLETINS

Bulletins giving detailed information covering Standard Types of Magnetic Separators gladly mailed upon request.

## FACILITIES

We carry certain Standard Types and sizes of Magnetic Pulleys and Magnetic Separators in Stock at all times. We are prepared to design and build Magnetic Separators for every kind of service to which such Machines are adapted. We are also in a position to design and furnish complete Magnetic Mills for Concentrating Minerals.

# DOVER BOILER WORKS

Manufacturers, Engineers, Contractors of Steel Plate Construction

60 CHURCH STREET, NEW YORK, N. Y.

WORKS Dover, N. J.

Phones 1294 1295 CORTLANDT

## PRODUCTS

Steel Plate Construction of Every Description including: Tanks for the Storage of Water, Acids, Oils, Tar, Asphalt, Gasoline, Molasses, and all Other Liquids; Compressed Air Tanks; Vacuum Tanks; Dissolving Tanks; Heating Tanks, etc.; Stacks; Flues; Penstocks; Flumes, Riveted Pipe; Chutes; Hoppers, etc.; Bins for the Storage of Ores, Lime, Coal, Chemicals, etc.; Stills, Dryers, Digestors, Agitators, Crystallizing Pans, Char Filters, Scrubbing Towers, Condensers, and all Kinds of Riveted Steel and Iron Equipment for Industrial Chemical Plants; also Welded Steel Plate Construction.

## FACILITIES

Our plant is situated at Dover, N. J., on the main line of the D., L. & W. Railroad, only 40 miles from the port of New York. Being thus conveniently located and having ample facilities for making shipments, we are able to make prompt deliveries to points in practically every part of the country.

Our plant is modern and efficient and completely equipped for turning out the kind of work in which we specialize.

## SERVICE

Our organization is composed of engineers and workmen who have had a long period of successful experience in designing and constructing steel plate equipment. We prefer to work from blue-prints furnished by our customers. When necessary, however, we will submit designs for equipment based on rough sketches submitted us by engineers or plant superintendents.

All of our equipment is subjected to rigorous inspection before leaving the factory, and the tests are made sufficiently severe to insure the apparatus meeting the local conditions under which it will be working when used by the customer.

## INQUIRIES

We are always pleased to quote and prepare estimates on any drawings or specifications which may be submitted to us covering any work in our line. In submitting requests for quotations it is advisable to avoid delay, to give us as detailed information as possible and wherever possible to accompany the written information with drawings. The information submitted should include all dimensions; internal or external pressure which the equipment will have to withstand, number and sizes of openings; number, size and position of lugs, flanges, etc., and any further data which it may be possible to give with regard to the conditions under which the equipment will be used.

The more complete the data with which we are supplied the more intelligently and the more quickly we will be able to quote on your requirements.



HORIZONTAL STILL 10 FT. DIAM. x 30 FT. LONG



SELF-SUPPORTING STACK 250 FT. x 18 FT.



Cable Addresses  
 "DORRCLASS", New York  
 "DORR", Denver  
 "CYANDORMAC", London  
 Code Bentley

## THE DORR COMPANY

Engineers

101 Park Avenue  
 NEW YORK, N. Y.



DENVER  
 1009 Seventeenth Street  
 LONDON  
 16 South Street

### PRODUCTS

A complete line of apparatus for Classifying, Dewatering, Settling, Leaching, Washing and Agitating.

### SERVICES

We are specialists in separation, sedimentation and dewatering as applied in the concentration of ores and in the treatment of trade waste and in special fields of chemical manufacture, with a wide range of experience and achievement.

Our laboratory and test plant at Westport, Conn., is devoted to the development of the constantly increasing applications of Dorr equipment and to research for clients in chemical, industrial and metallurgical problems. A capable technical staff is also available for the design or improvement of plants and the operating management of entire properties.

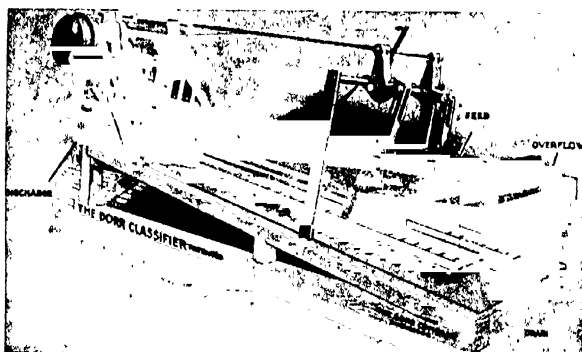
### GENERAL APPLICATION

By means of Dorr apparatus many processes formerly intermittent can be made continuous, greatly reducing operating costs and labor requirements.

### THE DORR CLASSIFIER

Built in two models, "C" and "D," consists of a settling tank in the form of an inclined trough open at the upper end. The feed enters near the center and the liquid and slow settling solids overflow at the closed end, while the sands or quick settling solids are conveyed along the bottom by mechanically operated reciprocating rakes and, after emerging above the liquid line, are discharged at the open end.

All parts moving on each other are suspended above the liquid so that wear is eliminated.



THE DORR CLASSIFIER (Patented)

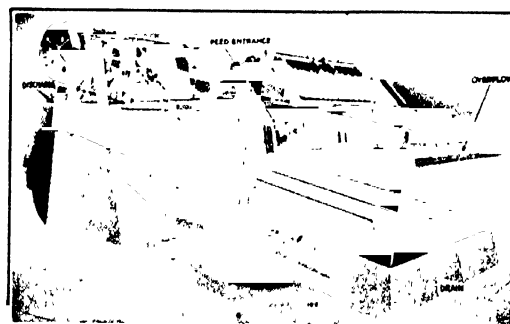
**Capacity**—From 25 to 1400 tons of solids per 24 hours, depending on size of machine, dilution and screen test of feed, and point of separation desired.

**Products**—Will make a separation at from 28 to 200 mesh and deliver sand dry enough to be carried on belt conveyor. For finer separations see the Dorr Bowl Classifier.

**Regulation**—By means of baffles, sprays, speed of rakes, dilution, and amount of feed.

**Operating Cost**—Power 1 1/2 H. P. per 150 tons solids. Maintenance 02 to 05 cent per ton solids.

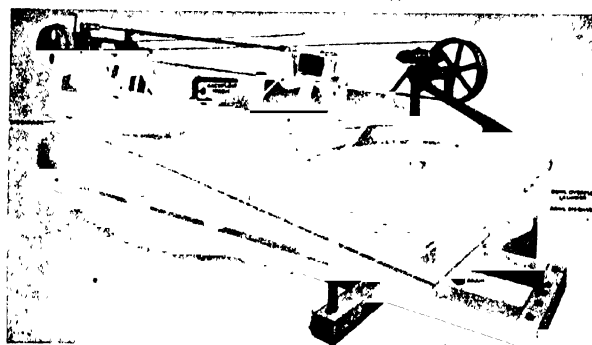
**Uses**—Dewatering any granular product. Separation of clay from sand. Closed circuit fine grinding of silica, paint pigments and solids of similar physical properties. Washing sand. Continuous production of milk of lime.



DORR CLASSIFIER, MODEL "D"

### THE DORR BOWL CLASSIFIER

This machine is advocated for the production of fine floated products, such as paint pigment, which must be entirely free from grit. The Bowl gives the increased



THE DORR BOWL CLASSIFIER (Patented)

Consists of two parts: a bowl or classifying chamber with slightly sloping bottom kept free from solids by a small Thickener mechanism and a dewatering chamber with a connection to the Bowl and in which the sands from the latter are dewatered. Will make separations at 350 mesh if desired.

settling area necessary to allow the fine particles of grit to settle. The Thickener Mechanism sweeps the settled grit to the center of the bowl where it is discharged through an orifice to the tank compartment, from which it is removed by the reciprocating rakes. Any valuable product carried down with the grit is set free by the agitation produced by the rakes and is carried back into the bowl by backflow water introduced in the tank compartment. Thus a high recovery is obtained, the grit being discharged practically free from fines.

### MULTI-DECK WASHING CLASSIFIER

This is in effect a series of Dorr Classifier tanks and rakes operated by a single driving mechanism and so arranged that the granular material is discharged from one into the next in the series, while the wash water flows in the opposite direction, thus effecting counter-current washing. It is used for leaching granular or crystalline products and washing them free from dissolved materials.

*Continued on Next Page*



**THE DORR REACTION AGITATOR**

The Dorr Reaction Agitator is an agitation tank tipped with a mechanism consisting of a vertical air t which can be revolved by a shaft supported from the top of the tank and equipped with distributing arms above the liquid level and plow arms at the bottom which sweep the pulp to the center. This secures uniform circulation and allows an intensity of agitation to suit the requirements of the material being treated. Means are provided for readily bringing the pulp into suspension after a shut down and when necessary steam coils are set in the tank.

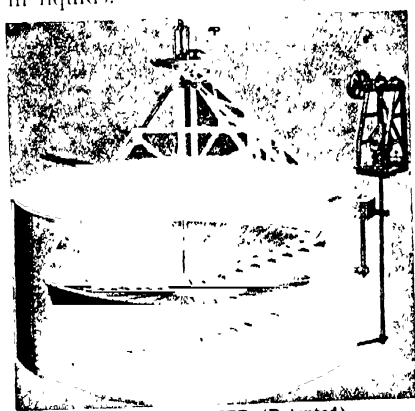
The Dorr Reaction Agitator has demonstrated that continuous agitation may be used

to great advantage in many chemical operations where it was formerly considered essential to work in batches. Causticizing Soda Ash with Lime is an example

of this which, in practise, has resulted in a conversion of 93% making a 15° Baumé solution, as compared with 92% in a 13° Baumé solution using batch agitation.

**THE DORR THICKENER**

Consists of a slow moving mechanism set in a tank or basin affording a means for the continuous settling and dewatering of finely divided solids carried in suspension in liquids.



DORR THICKENER (Patented)

The thickener mechanism is made up of radial arms attached to the lower end of a vertical shaft driven by a worm and worm gear. The arms carry plow blades set at an angle which, through the rotation of the mechanism, move the settled material to a discharge opening at or near the center of the tank. The feed enters continuously at the center of the tank, and the peripheral overflow trough collects the clear liquid.

The underflow, consisting of the thickened solids, is preferably controlled by a Dorrco Pump.

The Tray Thickener, of which several types have been developed, furnishes means of multiplying the settling capacity without increasing the floor space required. As many as three trays are in use in a single tank.

**Capacity**—Thickeners are in use in tanks from 6' to 200' diameter, handling from 2 tons to 3000 tons of solids daily.

**Applications**—The Dorr Thickener is handling a wide range of products, from silicious material ground through forty mesh screens which can be discharged containing 30% to 40% moisture to precipitated ferric hydrate and the lightest of finely divided organic material, such as sewage, rubber wastes, etc.

Where dilute pulps have to be filtered, prior thickening increases greatly the capacity of the filter and reduces the cost of treatment.

The Dorr Thickener is applicable in practically every case where settling and decantation is required.

**CONTINUOUS COUNTER-CURRENT DECAN-TATION**

Is a method of washing finely divided solids such as pulverized ore gangue, precipitates and similar materials, free from liquid containing dissolved materials in a series of settling tanks. The solids to be washed pass successively from tank to tank while the water or liquid used for washing flows in the opposite direction. The solids from each settling tank are diluted with liquid overflowing from subsequent units in the system, forming the feed to the following settling tank.

The Dorr Multideck Classifier or a series of Standard Classifiers is used for this purpose on material from 100 mesh to  $\frac{1}{2}$ " that will settle rapidly and can readily be raked above the liquid level. For washing finer materials which require a greater settling area a series of Thickeners is used with Dorrco Pumps to transfer the thickened product from one to the next.

**THE DORRCO PUMP**

A self-contained Diaphragm Pump with flat valves, designed after long experience to give continuous operation and close control of Dorr Thickener under-flows with minimum repair costs. Pump bodies are made with one inch, two inch, three inch and four inch suction and frames to carry from one to four bodies are in use. Adjustable eccentrics allow close regulation.

THE "DORRCO" PUMP  
(Pat. Applied for)**CONSTRUCTION**

Where acid liquors are used or where discoloration of a product has to be considered, the principal submerged parts of the machines are made of wood or lead covered iron and steel, and the blades are made of Duriron, Glass, Stoneware, or Bronze.

**BULLETINS**

We issue numerous bulletins covering every phase of the design, construction and operation of our various machines and installations.

# M. J. DOUGHERTY CO.

Piping Fabricators and Engineers

Factory and Main Office - 25th Street and Washington Avenue  
PHILADELPHIA, PA.

## BRANCH OFFICES

25 West Third Street, New York, N. Y.  
258 Candler Avenue, Atlanta, Ga.

1597 St. Clair Avenue, Cleveland, O.  
2522 Jefferson Avenue, W. Detroit, Mich.

## PRODUCTS

Industrial Piping, High and Low Pressure, for Steam, Gases, Oils, Water, Acids, Alkalies, etc.

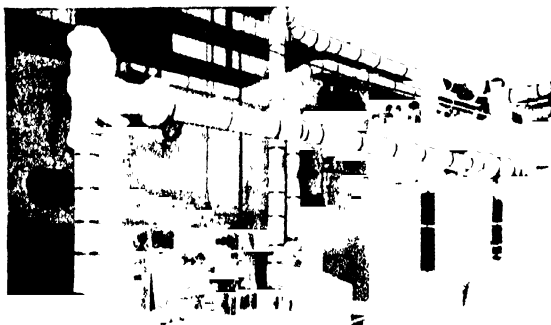
Pipe Bends, Welded Headers, Square-Lap Vanstone Flanged Joints, Fittings, Pipe, Valves.

Fabricated Pipe Work of any design.

## SERVICES

The Dougherty product is fabricated in our new factory and can be installed in your plant by our erecting crews if it is so desired.

Having at our command equipment which is ac-



COMPLETE POWER PLANT INSTALLATION

knowledge to be the most modern and unique in the efficient development of the industry, we can offer you real quality at prices that are sure to be attractive.

Complete piping contracts can be executed for Public Utilities, Central Stations and Power Plants for manufacturing purposes, Chemical Works, Paper and Pulp Mills, Rubber, Soap and Automobile Factories, Oil and Sugar Refineries, Cotton Oil, Silk and Textile Mills, Coal and Metal Mining Operations, Steel Plants and Fertilizer Works, Water Cooling Systems, and Waste Heat Boiler Installations for Cement Plants and allied industries.

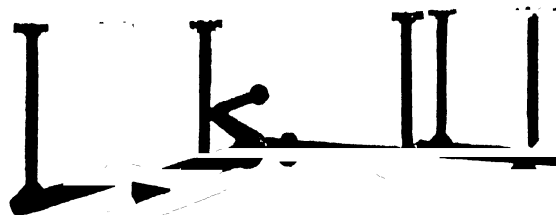
## FACILITIES

We fabricate and erect complete, piping for all purposes, either to our own measurement and plans, in which case we take all responsibility, or according to blue prints to be submitted by you. Or, if it is so desired we will furnish materials only. Our erecting crews are stationed all over the country. Although we get a number of contracts from engineers and architects, we have one of the most efficient engineering departments in the piping industry.



A concern is known by the clients it serves and when repeat orders are secured, the value of the service rendered is obvious. Such a list of Dougherty served clients would include:

Edison Portland Cement Co. Savannah Sugar Refining Co.  
Merriman Chemical Company Raritan Copper Works  
Virginia Carolina Chemical Co. Imperial Tobacco Products Co.  
Baldwin Locomotive Works Hershey Chocolate Company



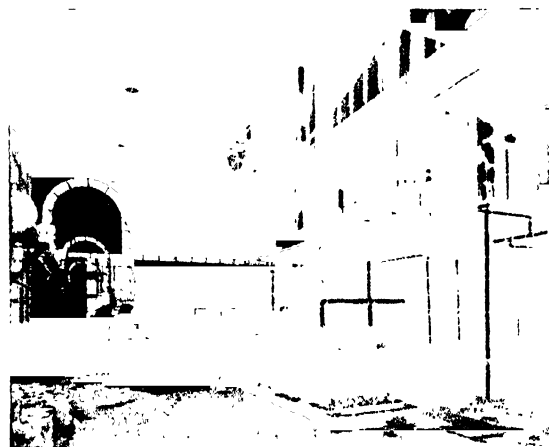
A SPECIALLY DESIGNED HEADER FOR CHEMICAL PURPOSES

The Electric Storage Battery Co.  
Victor Talking Machine Company  
West Virginia Pulp & Paper Co.  
Tennessee Copper Company  
Standard Silk Company  
Matheson Alkali Works  
Vrethe Petroleum Company  
Miami Copper Company

Bethlehem Steel Company  
Standard Oil Company  
Eastern Potash Company  
Owens Bottle Company  
New Jersey Zinc Company  
Solar Refining Company  
Caribbean Sugar Company  
Lehigh Portland Cement Co.

## INDUSTRIAL PIPING, ITS IMPORTANCE TO EFFICIENT PLANT DESIGN

Until recently the power plant field has been a neglected study because of the comparative cheap cost of fuel. Too little consideration has, therefore, been given to the piping feature. Few executives realize the amount of piping involved in the modern industrial plant, the complexity of it, or the dependence placed upon it. A study of this problem is all the more necessary because of the present high cost of coal and other fuels.



PIPING INSTALLATION IN GAS PRODUCER PLANT

*Continued on Next Page*

Piping plays an essential part in most industrial plants. It is a vital factor in plant reliability and safety and the question of economy, not so much of original installation, but more so of maintenance is of paramount significance. Economy in first cost is "Penny wise and pound foolish" if the executive buys a service that is cheap as far as original price is concerned but expensive every day thereafter.



AIR CONDENSER PRESSURE STILL FOR AN OIL REFINERY

Piping for industrial purposes to convey either steam, water, air, oil or any other gases or liquids to various agencies is in every case a problem requiring the service of the highest type of engineering skill. Only by proper design, correct fabrication and erection can lastingly good piping be attained.

Modern practise is to select higher steam velocities by using smaller pipe and adopting superheat. This reduces original cost, lowers heat losses and effects highest plant efficiency.



13-TON ELBOW BEING MACHINED AND DRILLED FOR SQUARE LAP FLANGED CONNECTION

### THE SQUARE LAP FLANGED JOINT

Leading engineers invariably will specify pipe flanged by the square lap (Vanstone) Joint, as it is made to suit all purposes of pipe line connections. The Dougherty improved system of manufacture is recognized as the ideal.

The Square Lap Flanged Joint is made by turning over the end of the pipe and facing off to insure even



bearing of the gaskets. The flange is loose, thus saving the erector time in setting the bolt holes in place. The lap being rolled to the inside edge of the bolt holes, maximum bearing for gasket is obtained, and the water pocket eliminated. The lap is 75% heavier at the radius than the walls of the pipe, and machined on the face, edge and back.

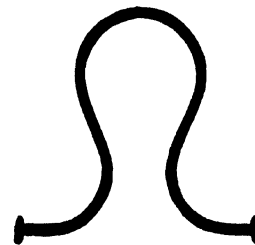
The Dougherty Square Lap Joint is made in the standard and extra heavy weight pipe, with high hub cast iron and semi-steel and forged steel high and low hub flange.

### PIPE BENDS

The inauguration of high pressure boilers and engines has necessitated many marked improvements in the piping of steam plants. To allow for expansion and contraction, and to give flexibility in pipe lines, special bends are now a necessity. Our factory is equipped to bend pipe of any diameter to sketch and to fit it with screwed, welded or our improved square lap flange. Detailed tables of Quarter and U-bends will be furnished upon application, but Expansion and other special bends must be given special consideration.



WELDED HEADER



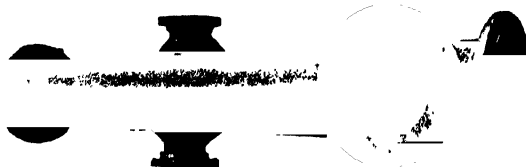
12 FT EXPANSION BEND

### WELDED STEEL HEADERS

Steel headers with welded nozzles are recommended for severe service and superheated steam, as they reduce the number of joints under all steam, water or any other liquid conditions. They prevent leaky joints, and give as near one hundred per cent piping results as are possible. Welded headers save not only on original cost but more so on maintenance, for their use effects a lastingly tight connection.

A recent improvement inaugurated in all our header work is the reinforcing ribs on all nozzles of any length. They give added strength where this reinforcing is necessary.

Equipment of all welded headers with the square lap flange is recommended on all high pressure steam lines.



WELDED STEEL HEADER (Note reinforced necks)

For further information regarding our product and our facilities write our nearest office. Ask for Bulletin A-21.

Established 1876

Incorporated 1885

**THE DOW CO.**

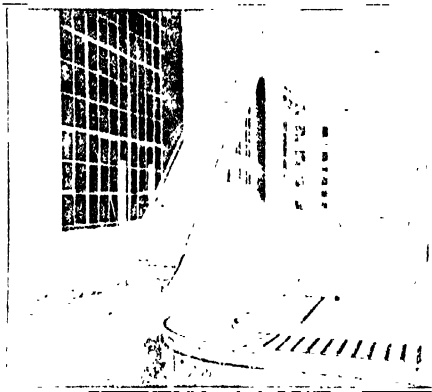
Incorporated

**Manufacturers of Gravity and Power Conveyors**1025-1251 Franklin Street  
**LOUISVILLE, KY.**NEW YORK OFFICE  
50 Church StDETROIT OFFICE  
8855 Woodward AveCHICAGO OFFICE  
1235 Old Colony Bldg

REPRESENTATIVES IN OTHER PRINCIPAL CITIES

**PRODUCTS****Gravity Roller Conveyors; Steel Spiral Chutes; Belt Conveyors; Portable Adjustable Elevators.****Also manufacturers of Apron Conveyors, Chain Conveyors, Slat Conveyors, Screw Conveyors, Bucket Elevators and Special Conveyors.****SERVICE**

This company places at the disposal of engineers, architects and prospective users the services of a skilled Engineering Department experienced in all manner of conveying problems. There is no charge for drawings and detailed information covering individual conveying layouts.

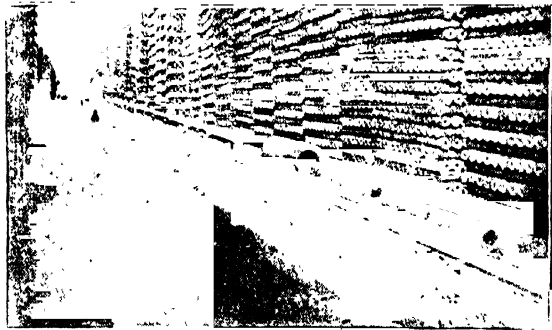
**PART OF AN EXTENSIVE SYSTEM OF DOW CONVEYORS IN A BREWERY**

Note the inclined elevator in the foreground and the two roller spirals in the background.

**SCOPE OF USE**

Dow Conveyors speed up production, eliminate expensive and uncertain labor and save valuable floor space.

Used by factories, foundries, canning and packing

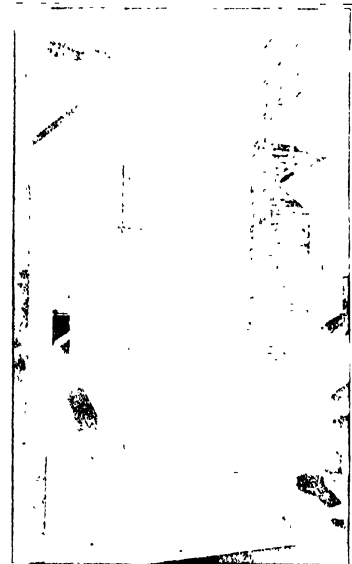
**PART OF A SYSTEM OF DOW BELT CONVEYORS**

Handling rolls of asbestos from factory to storage and shipping department.

plants, food product plants, oil refineries, bottling plants, munition plants—in fact, any place where quantities of materials or merchandise of any description must be handled from one place to another.

**GRAVITY CONVEYORS**

Furnish the ideal means of handling materials and products wherever they can be used. A grade of 3% to 5%, depending upon the nature of the merchandise, is necessary for the operation of gravity conveyors. They require no power or attention of any kind.

**DOW BUCKET ELEVATORS AND SCREW CONVEYORS**

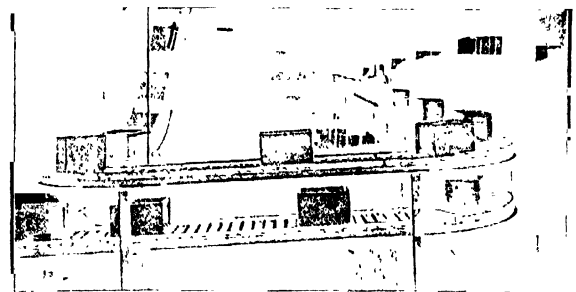
Handling fuller's earth from filters to purifying retort and back to filters.

**POWER CONVEYORS**

Of all descriptions, usually designed to operate in conjunction with gravity conveyors.

**ESTIMATES**

In writing for estimates or other data, state dimensions and weights of largest and smallest packages and

**DOUBLE DECK GRAVITY CONVEYORS HANDLING CASES**

This arrangement effects a great saving in floor space where large capacity must be handled, or where two types of products must be handled simultaneously to different points.

send drawing or sketch with dimensions indicating points between which goods must be handled.

# DOWNINGTOWN IRON WORKS, INC.

## Steel Tanks and General Plate Construction

OFFICE AND WORKS

DOWNINGTOWN, PA.

### PRODUCTS

Steel Tanks of all descriptions for all purposes, Steel Smoke Stacks, Smoke Flues, Stills, Condensers, Vulcanizers, Ballast Tanks, Riveted Steel Pipe, Water Tube Boiler Drums, Waste Heat Boilers, Tender Tanks; in fact, practically everything of steel plate.

### LOCATION

Our Plant is thirty-two miles from Philadelphia on the main line of the Pennsylvania Railroad and within seven miles of two of the largest plate mills in the East and within easy access of shape, bar and rivet manufacturers and Philadelphia warehouses, enabling us to obtain our raw materials promptly.

### FACILITIES

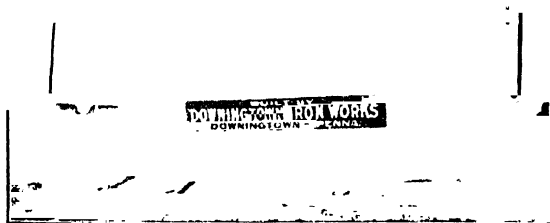
**Railroads:** Excellent railroad facilities

**Welding:** Electrically and by the Oxy-Acetylene Process.

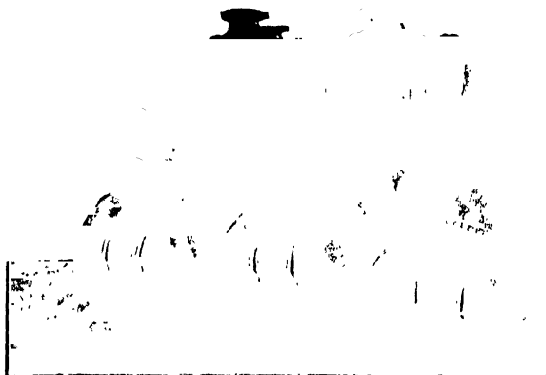
**Tools:** Hydraulic Riveter, Hydraulic Press, Punches, Drills, Rolls, Shears, Planer; in fact, all up-to-date equipment for fabricating steel plate.

### ORGANIZATION

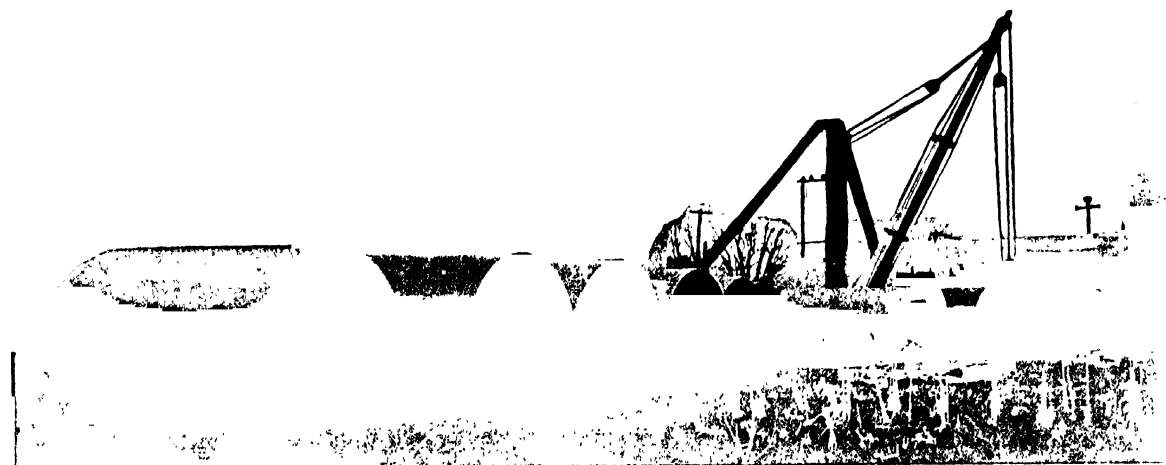
Made up of men who have had from twelve to thirty years' experience in the construction of steel plate work.



TENDER TANK



PRESSURE TANKS



TANK STORAGE YARD

## THE DRAPER MANUFACTURING CO.

Manufacturers of

Self-Recording Scientific Instruments

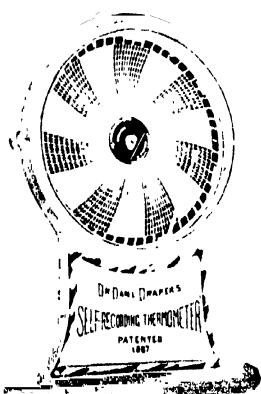
329 GREENWICH STREET, NEW YORK, N. Y.

### PRODUCTS

Draper's Self-Recording Thermometer, Draper's Self-Recording Hygrometer, Draper's Self-Recording Rain Gauge, Draper's Self-Recording Barometer, Draper's Force of wind instrument, Draper's Anemoscope, Draper's Anemometer.

### SERVICES

The Draper Mfg. Co. is in a position to supply the scientific instruments developed and patented from time to time by Dr. Daniel Draper, the scientist. Our force of skilled instrument makers have a complete knowledge of every working part of our instruments. We send these men out to set up these instruments, to make repairs when necessary, as well as to instruct operators in their proper maintenance.



SELF-RECORDING THERMOMETER

### DRAPER'S SELF-RECORDING THERMOMETER

The thermometer gives a permanent and continuous record of the temperature.

In this instrument a clock revolves a disc, on which is placed a chart, indicating the hours of the day and days of the week, by radiating divisions, and gives the degrees of temperature, Fahrenheit scale, from 20 degrees below zero to 110 above, by concentric circular divisions.

### DRAPER'S SELF-RECORDING BAROMETER

Draper's Self-Recording Barometer indicates and records accurately the barometric pressure. The time on the chart is divided into hour spaces, and the mercurial column measured to the hundredth of an inch. The glass tube is 36 inches in length, the upper portion being of larger diameter than the lower.

When the pressure of the atmosphere diminishes, a portion of the mercury flows out of the tube into the reservoir; this, becoming heavier, stretches the steel springs, causing the ink pencil fastened to them to mark downwards.

If the pressure increases, the reverse movement takes place. The record is made on the register, car-

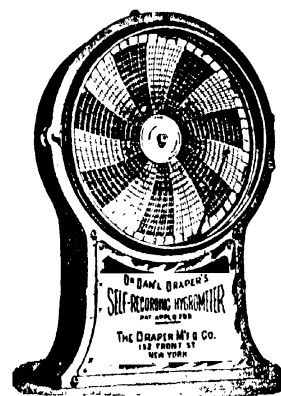
ried at the rate of half an inch per hour from right to left by the clock.

A special feature of our Self-Recording Barometer is the fact that our instrument is graduated to multiply three times. This enables the observer to note minute changes in atmospheric pressure that would not appear on the ordinary Barometer.

This instrument is used as a standard by leading Colleges, Universities, Observatories, and plants in this country and Europe.

### DRAPER'S SELF-RECORDING HYGROMETER

This instrument for measuring the amount of moisture or humidity in the atmosphere is built on accurate and scientific lines. It gives the measurements on a paper chart in percentages, 0 being dryness and



SELF RECORDING HYGROMETER

100, saturation. The chart makes one revolution per week. This instrument is applicable to every industrial use where an accurate and complete record must be kept throughout the year of atmospheric conditions and their effect on the products; such industrial plants as Textile and Food products, as well as Research Laboratories, Universities, Observatories, etc.

### DRAPER'S SELF-RECORDING RAIN GAUGE, STATIONARY TYPE

This instrument has a special value to a number of industries, such as Water Works, Mills, Agricultural Stations and Manufacturers.

The gauge is raised about seven feet above the roof; the pipe in connection with the rain-gauge leads the water to a wedge-shaped gravity bucket. This is delicately balanced in a frame that hangs from long spiral springs, and whose motion, up and down, is directed by vertical tracks.

### DRAPER'S SELF-RECORDING RAIN GAUGE, PORTABLE TYPE

This type has all the accuracy of the Stationary Type, but it has special features which make it particularly adaptable to certain requirements.

# DUFF PATENTS COMPANY, INC.

Manufacturers of  
Hand-Poked and Mechanical Producers

Sole Manufacturers of  
Christie Dryers, Calciners, Roasters, and Coolers  
OFFICE: FRICK BLDG., PITTSBURGH, PA.

WORKS: Behan St., North Side

## PRODUCTS

Gas Producers, Christie Dryers, Calciners, Roasters and Coolers, Steel Tanks, Stacks, Steel Riveted Piping and all kinds of Heavy and Light Steel Plate Work.

## APPLICATIONS

We have installed over 3000 of our Producers in the largest Iron, Steel, Glass, Chemical and Lime Plants in this country.

## BRADLEY GAS PRODUCERS

The Bradley Gas Producer construction involves two slotted cone grates running parallel with the steel water pan and from wall to wall of the producer. Each of these grates is divided in the center by a steel plate. These dividing plates extend the full length of the grates and divide each of the grates into two equal parts. Each of the half grates is supplied by a separate and independent steam blower. The grates in the Bradley producer are so arranged that an even and equal distribution of the air and steam is obtained in all parts of the fuel bed, making the gasification of the coal uniform in all parts of the producer and thereby reducing to the lowest possible minimum the formation of clinker and the poking of the fires.

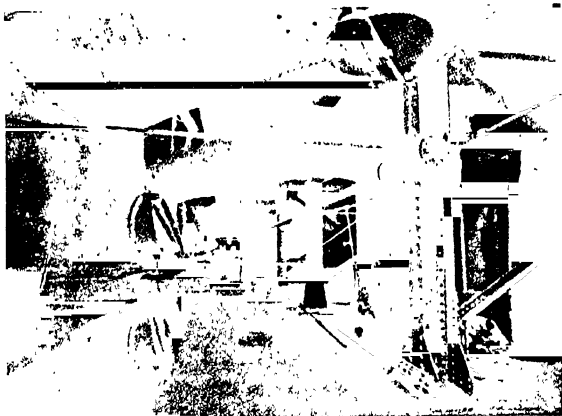
This producer is built in unit capacities of 12, 15 and 20 tons Pittsburgh run-of-mine coal per 24 hours.

Two men can operate four or five producers, when an overhead feeding arrangement is provided.

Where the coal is charged from the gas producer floor into the hoppers by hand labor two men operate three producers.

## LIME PLANTS

Our system of burning lime with producer gas assures an even and equal burned lime, and an increased output for a given amount of coal.



PITTSBURGH PLATE GLASS COMPANY, FORD CITY, PA.  
Hand-poked type



DRYER USING INDIRECT STEAM HEAT

We are the Sole Manufacturers of Direct, Semi-direct, Indirect and Steam Heat Dryers, Calciners, Roasters and Coolers as designed by the L. R. Christie Company of Pittsburgh, Pa.



SEMIDIRECT HEAT DRYER



SWANTON LIME CO. PLANT, SWANTON, VT

## SOME OF OUR CLIENTS

National Tube Co., Lorain, Ohio  
Brier Hill Steel Co., Youngstown, Ohio  
Pittsburgh Plate Glass Co., Ford City, Pa.  
Illinois Glass Co., Alton, Ill.  
Dominion Line Company, Sherbrooke, P. Q.  
Allegheny Plate Glass Co., Glassmere, Pa.  
American Bottle Co., Streator, Ill.  
Youngstown Sheet & Tube Co., Youngstown, Ohio  
Swanton Lime Co., Swanton, Vt.  
National Mortar & Supply Co., Gibsonburg, Ohio

## DRYING SYSTEMS, INC.

Designers and Builders of Drying and Conditioning Apparatus

11 S. Desplaines St.

CHICAGO, ILL.

### PRODUCTS

Drying Apparatus for:

Chemical, Biological and  
Pharmaceutical Products.

Milk, Eggs, Malt,  
Fruit Juices.

Aniline Dyes and Dry Colors,  
Fruits, Vegetables and  
Other Food Products.

Paint, Varnish, Enamel and  
Japan.

Glued-up, Veneered, and  
Dimensioned Stock.

Leather, Rubber,  
Textiles, Tobacco, etc.

Complete Industrial Air

Conditioning Systems.

Air Washers and Humidifiers.

Trucks, Trays, Pans, and other

Dryroom accessories.

### FEATURE

An important feature of our drying process, making it particularly desirable for all classes of atmospheric drying, is that the apparatus itself is an independent unit located outside of the drying chamber. This makes it possible to use the apparatus in conjunction with a chamber or tunnel of any size or shape, or even to use one apparatus for a series of chambers or tunnels.

This means that you can buy standardized equipment from us, which obviously can be furnished for less money, and in shorter space of time than specially designed equipment and your drying chambers or tunnels, together with conveyors, trucks and other accessories can be built to meet your particular requirements.

If you have any new drying problems or any old unsolved ones, it will not entail any obligation on your part to submit them to our Engineering Department for consideration.

### TUNNEL TYPE DRYER

The apparatus pictured in Plate No. 1 is our new tunnel type drying apparatus. This machine is designed to handle any product which is susceptible to drying on wire mesh or wooden slat trays, but is espe-

cially desirable when the product can be handled on wooden slat trays, because this will make it possible to operate the apparatus in conjunction with our reversible and interlocking trays, and our automatic dumping device (Patents pending).

The tunnel type machine is available in single units having drying space for from 3 to 8 trucks, and in multiple units having space for from 6 to 48 trucks.

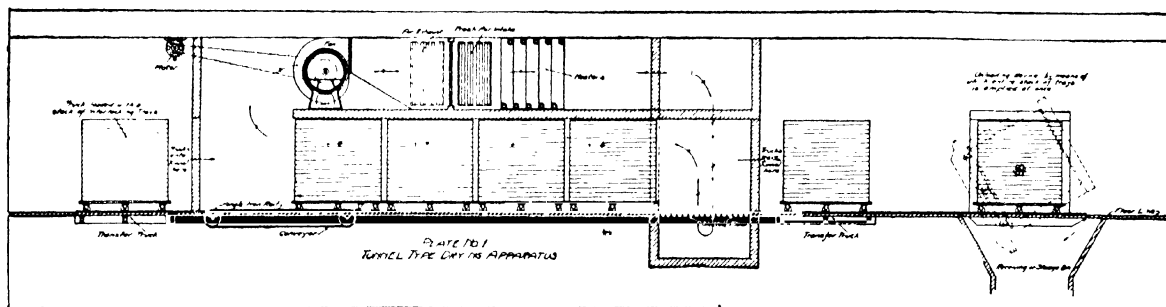
A standard truck-load of wire mesh trays consists of sixty 36" x 42" trays, totaling 630 square feet of tray surface per truck; and a standard truck-load of wooden slat trays consists of twenty-seven 42" x 72" trays, totaling 520 square feet of tray surface.

The operating cycle of the tunnel type machine (patent pending) used in conjunction with our wooden slat trays and dumping device, is as follows. The material to be dried is spread on trays, either by hand or mechanically. Twenty-six trays are then stacked one above the other, on the bottom tray, which is equipped with truck wheels, whereupon the truck load is ready for drying. The door is opened, the truck pushed into the tunnel, a conveyor engages it and moves it forward one full truck length. Succeeding trucks follow the first, each being moved forward one full truck length by the conveyor, until the entire tunnel is filled. After this, whenever a new truck is ready for drying, a dry truck is ready to be pulled out at the far end. As soon as a dry truck has been removed from the tunnel, it is transferred to the automatic dumping device where the entire load of dry product is dumped into storage bins in one operation, requiring less time to do this than is generally required to unload a single tray. In order to prevent all possibility of a dusting of the dry product the dumping device is entirely enclosed. After dumping, the empty truck is immediately returned for reloading, which means that the original truck equipment need only be one or two in excess of those actually in the tunnel, and also means that there will never be any idle trucks occupying valuable factory floor space.

### COMPARTMENT TYPE DRYER

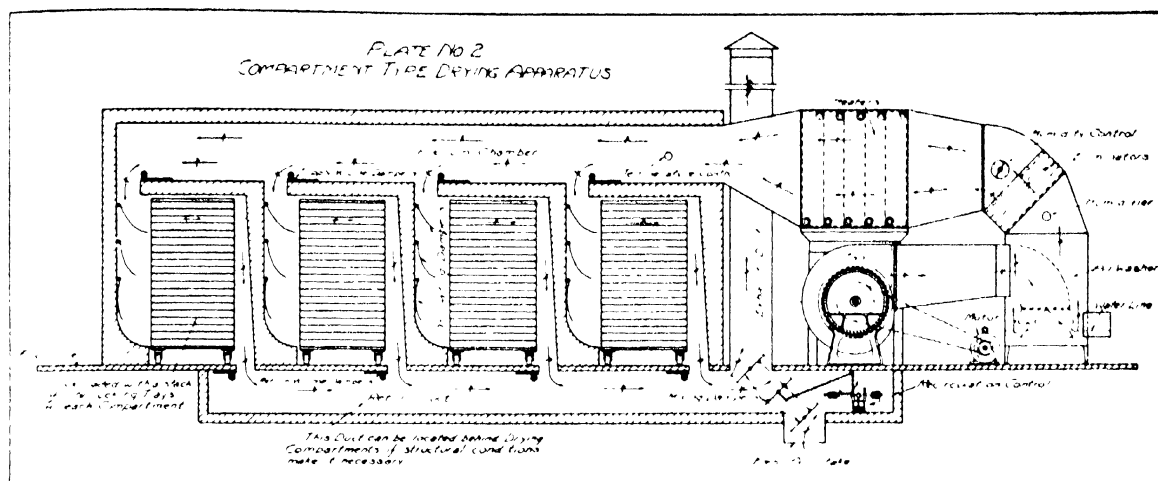
The apparatus pictured in Plate No. 2 is our improved compartment type drying apparatus, and is designed to handle any product which is susceptible to drying on trays or in pans, and is available in any desired size from one to twenty compartments.

Each compartment is built large enough to hold one rack or truck load of trays or pans. If wire mesh trays are used, a standard truck load consists of sixty 30" x 30" trays, making a total of 375 square feet of tray surface per compartment. If wooden slat trays are used a standard truck load consists of twenty-seven 30" x 60" trays, making a total of 337 square feet of tray surface, and if galvanized iron or block tin pans are used a standard truck load consists of



Continued on Next Page





sixty 20" x 30" pans, making a total of 250 square feet of pan surface.

The particular features which make this type of drying apparatus most desirable are as follows:

The product to be dried is conveyed to the drying compartments by means of trays and trucks, which makes it possible to load and unload in a comfortable working temperature, and also reduces to a minimum the time during which the dryer is idle.

The trays are spaced as close together as the product will permit, thereby insuring a maximum production in a minimum amount of floor space.

Each compartment is virtually an independent drying unit, and only the compartments which are loaded need be operated.

All of the air delivered to the drying compartments is washed practically free from dust and dirt, and if conditions require it, is humidified to that particular degree of relative humidity best suited for your work.

The Greeff Static Air Washer-Humidifier (Patents No. 848,340 and 848,341) used in this connection is absolutely unique in that it produces a perfect washing and humidification of the air, without pump, motor, spray heads or piping. Inasmuch as there are no moving parts, there is nothing to get out of order and the washer is always working at its highest efficiency.

All of the air delivered to the drying compartments is uniform in temperature and humidity and a portion of the air after it leaves the drying compartments is allowed to recirculate through the fan and air washer. Temperature, humidity and recirculation (Patents pending) are always under accurate automatic control which reduces the cost of operation and makes the apparatus absolutely independent of outside weather conditions.

All of the air delivered to the drying compartments is distributed uniformly to and through each compartment by means of the mechanical oscillating dampers (Patents No. 1,172,575 and 1,284,218) which cause the entire volume of air delivered to each compartment to flow in rotation through the first, second, third and four levels of the compartment. The effect of passing the entire volume of air over one-fourth of the tray surface in this intermittent manner is to bring about a very high pick-up of the surface moisture, followed by three periods of rest or breathing spells during which time the remaining moisture redistributes itself evenly throughout the mass.

#### SPRAY TYPE DRYER

This equipment consists essentially of a Combination Drying and Collecting Space into which the liquid is introduced through steam or air operated nozzles in the form of a finely divided mist, into an atmosphere heated up to 300°F. or more.

The drying takes place instantaneously and the dry powder falls into the Separation Space where the product and the moisture laden air are removed separately, the powder going into the Packing Hopper

from where it can be removed either continuously or intermittently, as desired. This equipment is advantageous in that all of the material is collected at one point without the usual complicated system of collectors and baffles, consequently eliminating the necessity of mixing the powders collected at various points in order to get a uniform product. This also accomplishes a considerable saving in floor space.

Because of the fact that the product is immediately eliminated from the hot chamber many materials such as eggs, milk and syrups containing sugars, proteins, and albumin can be handled without injurious effects from coming in contact with surfaces heated to excessive temperatures.

The spray apparatus as manufactured by us is very simple to operate and does not require expert labor. There is very little to wear out so that the maintenance is fractional. This insures a long life for the equipment.

We specialize in the design and installation of complete equipments for spray drying, exclusive of the buildings and boilers, and are prepared to execute contracts of any size. These dryers are built with capacities to suit the requirements of the purchaser.

A test plant of sufficient capacity is available for careful study of any material.

The following represents a few of the products in liquid form which have been successfully dried by the spray method:—

Milk	Starch (boiled)	Malt
Eggs	Starch (raw)	Blood
Fruit Juices	Glue	Blood Serum
Dyes	Glucose	Blood Albumin
Colors	Cane Juice	Sulphite Pitch
Tanning Extracts	Salt	Mine Slurries
Logwood	Various Drugs	Arsenate of Lead
Soap	Chemicals	Sulphur

Send us a sample of your product and we will make a thorough test in our equipment and submit dry samples, without further obligation.

#### LABORATORY EQUIPMENT

An ideal equipment for experimental and research work consists of an apparatus 3'0" x 8'0" x 6'0" high. The drying compartment will accommodate twelve 30" x 30" wire mesh trays or twenty 15" x 30" metal pans. The results obtained with this apparatus can be duplicated on a large commercial scale. It is shipped out completely assembled; steam connections and wiring of motor being the only work necessary on customer's premises.



# THE DURIRON COMPANY

## DAYTON, OHIO

New York  
Cleveland  
Pittsburgh

Chicago  
Atlanta  
Montreal

Denver  
Salt Lake City  
San Francisco

### PRODUCTS

Acid Lifts, carboy and drum; Anodes; Arsenic Acid Plants; Autoclaves; Bibcocks; Blowcases; Cascade Systems; Casseroles; Cocks; Concentrating Systems; Condensers; Crucibles; Denitrating Systems; Distilling Apparatus; Ejectors; Evaporating Dishes and Pans; Exhaust Fans; Gate Valves; Jacketed Kettles; Jets; Laboratory Apparatus; Manifolds; Nitric Acid Systems; Pipe and Fittings; Pumps, Centrifugal and Reciprocating; Pots; Pickling Apparatus; Radiation Units; Safety Valves; Spray Nozzles; Sinks; Stills; Stirrers; Tanks and Tank Connections; Towers; Vats; Valves; Special Castings.

### DURIRON

Duriron is an extremely hard cast metal alloy containing the proper silicon content to render it entirely resistant to virtually all acids and alkalis used commercially. It has also the desirable property of strength, and is entirely homogeneous, equally resistant on all surfaces and all through the structure. **Its hardness renders it intensely resistant to erosion.**

At temperatures slightly below its melting point (about 2300°F.) it will not soften materially nor lose its shape, and it shows no tendency to oxidation even at the highest temperatures.

On account of its hardness Duriron cannot be machined with cutting tools. It is finished by grinding, and for this work there has been developed a variety of special machines so complete that we can perform virtually all processes of finishing with the exception of threading.

It will be readily appreciated therefore that Duriron apparatus must be produced by this Company, and that ingots or pigs cannot be furnished. The wide serviceability of Duriron in the field of commercial chemistry has resulted in the production of Duriron apparatus and equipment for virtually every process where acids and alkalis are handled or carried, while the widespread adoption of chemistry by industry in general

has so widened the field for Duriron that it is now used in a multitude of industries where corrosives are employed to increase the efficiency of production and product.

Our chemical and mechanical engineering forces are maintained to advise and to cooperate in the design of new equipment, and to suggest the adoption of standard equipment for new processes and for all development. Their wide experience will be found valuable, and their services are furnished without obligation.

The adoption of Duriron equipment wherever corrosion is the problem makes an installation permanent; eliminates the expense of repairs and replacements, with their consequent reduction of output; allows for greater and more economically produced product; and betters plant conditions by eliminating the hazard incident to the handling of corrosives.

### BULLETINS

All literature is published in bulletin form, this having been found more satisfactory than a general catalog, due to the wide field served by Duriron. Our various types of apparatus are described in detail in these bulletins, and they are constantly being added to and amended, as new uses and mechanical betterments make this necessary.

At present the following bulletins are available, and will be sent on request:

- No. 102—Condensers
- No. 103—Denitrating Systems
- No. 105—Pickling Tanks
- No. 107—Carboy Acid Lift
- No. 111—Comparative Tests on Vitrified Tile, Lead and Duriron Pipe, made by the Testing Laboratories of Columbia University.
- No. 112—Centrifugal Pumps—Nos. 100-A and 105
- No. 114—Duriron's Value to the Photo-Engraver
- No. 115-A—Centrifugal Pump—No. 101
- No. 116—Duriron—a general description
- No. 117—Exhaust Fans
- No. 118—Laboratory Equipment
- No. 119—Reciprocating Pumps

### U. S. BUREAU OF STANDARDS DEPRECIATION TESTS ON DURIRON

Corrosive	Solution, % by weight	Four months at 15°-20° C		One month at 82°-88° C	
		loss in mgs. per sq. cm.	% loss	loss in mgs. per sq. cm.	% loss
Sulphuric Acid	95% H <sub>2</sub> SO <sub>4</sub>	118	007	106	006
Sulphuric Acid	25% H <sub>2</sub> SO <sub>4</sub>	272	016	1 350	076
Sulphuric Acid	10% H <sub>2</sub> SO <sub>4</sub>	398	025	2 28	126
Nitric Acid	70% HNO <sub>3</sub>	105	006	218	012
Nitric Acid	25% HNO <sub>3</sub>	123	007	575	054
Nitric Acid	10% HNO <sub>3</sub>	no loss	no loss	3 77	232
Hydrochloric Acid	25% HCl	46 992	2 862	534 40	32 170
Hydrochloric Acid	5% HCl	18 9	1 162	71 351	4 186
Acetic Acid	99% CH <sub>3</sub> COOH	105	006	039	002
Phosphoric Acid	87% H <sub>3</sub> PO <sub>4</sub>	105	006	629	038
Phosphoric Acid	25% H <sub>3</sub> PO <sub>4</sub>	166	010	658	038
Phosphoric Acid	10% H <sub>3</sub> PO <sub>4</sub>	136	008	405	024
Oxalic Acid	7 9% (COOH) <sub>2</sub> 2H <sub>2</sub> O	238	014	1 975	111
Oxalic Acid	2 1% (COOH) <sub>2</sub> 2H <sub>2</sub> O	211	013	444	025
Alum	15% Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> K <sub>2</sub> SO <sub>4</sub> 24H <sub>2</sub> O	105	006		
Picric Acid	9 1% OH.C <sub>6</sub> H <sub>3</sub> (NO <sub>2</sub> ) <sub>3</sub> (Alcoholic Solution)	077	005	219	013
Copper Sulphate	25% CuSO <sub>4</sub> 5H <sub>2</sub> O	133	008	1 605	093
Ammonium Chloride	27% NH <sub>4</sub> Cl	568	026	4 375	250
Ferric Chloride	48% Fe <sub>2</sub> Cl <sub>6</sub>	229	013	326 552	17 816
Ferric Chloride	7% Fe <sub>2</sub> Cl <sub>6</sub>	272	016	106 874	6 276
Oleic Acid	Commercial Oleic	046	003	099	006
Pyrogallie Acid	31% C <sub>6</sub> H <sub>3</sub> (OH) <sub>3</sub>	122	007	508	031

In addition to the corrosives mentioned in the above table, Duriron is very resistant to the following alkalis and acids:

Alkalis				Acids			
Ammonium Carbonate	Ferrous Chloride	Tin Tetrachloride	Calcium Chloride	Benzoic	Hydrocyanic	Arsenic	
Ammonium Hydroxide	Sodium Chloride	Calcium Carbide	Lead Arsenate	Butyric	Lactic	Boric	
Calcium Sulphate	Sodium Hydroxide	Carbon Tetra Chloride		Formic	Tartaric	Pyroligneous	

We do not recommend Duriron for the following: Bromine, Hydrofluoric Acid, hot solutions of Ferric chloride and sulphur monochloride. We are prepared to furnish actual tests on the above acids and alkalis.

Continued on Next Page

- No. 120—Duriron's Value to the Sanitary Engineer  
 No. 122—Standard Pipe and Fittings, Valves, Cocks, Ejectors, etc.  
 No. 123—Kettles  
 No. 124—Sulphuric Acid and Fertilizer Plants  
 No. 125—Radiation Units, and Acid Equipment  
 No. 126—Drain Pipe and Sanitary Fittings, Sinks, Drains, etc.

Those desiring to make their own tests of Duriron's resistance to corrosion will be furnished with sample of this alloy, our guarantee being that any material furnished will be equally resistant.

#### PHYSICAL PROPERTIES OF DURIRON

Spindle gravity	7.00
Weight per cubic inch	0.253 lb.
Tensile strength	about 10,000 lbs. per square inch
Transverse strength	1,000 lbs. with deflection between $\frac{1}{16}$ " and $\frac{1}{8}$ "
Compression strength	70,000 lbs. per square inch
Melting point	about 2300°F
Coefficient of expansion	0.0001565 per degree F
Shore scleroscope hardness	49-51
Contraction allowance in casting	$\frac{1}{16}$ " per foot
Electrical resistivity	63.3 Microhms per cc. at 0°C 71.2 Microhms per cc. at 18°C 94.4 Microhms per cc. at 100°C

#### THERMAL CONDUCTIVITY (Values, Except Duriron, from Kent)

	Silver	Copper	Aluminum	Cast Iron	Duriron	Lead	Glass
1000	811	665	359	323	287	2	

#### DURIRON STANDARD PIPE

Is cast in standard lengths and forms. It is superior to all other forms of acid-resisting pipe, being stronger and equally resistant to corrosion inside, outside and all through the wall. Standard Duriron Pipe is now made with collar cast on the ends, and joint is made with split flanges of a very high tensile gray iron (made by ourselves). While pipe cast with integral

flanges may still be furnished, the great superiority of the split flange type recommends it in most cases.

#### BELL AND SPIGOT (OR HUB) PIPE

For drain lines, or where low pressures are carried, Duriron Bell and Spigot Pipe is most desirable, being more readily installed, and not requiring exact alignment.

#### COMPRESSION COUPLINGS

In long lines, and those subject to wide temperature variations, it is often desirable to use an occasional compression coupling joint, to take care of expansion, and to serve as a convenient means of opening up the line.

#### PIPE FITTINGS

Complete lines of pipe fittings, both for Standard and Bell and Spigot Pipe, are furnished. Standard fittings may be had either for split flange, or with integral flange. Bell and Spigot fittings have recently been redesigned to comply with the most exacting requirements of modern sanitary and plumbing codes.

#### CONNECTIONS TO OTHER PIPE

By means of companion flanges, which we furnish, Duriron lines may be connected to all other types of pipe. Long experience in meeting such requirements makes it possible for us to supply suitable connections in all cases.

#### TESTS

All forms of Duriron Pipe are thoroughly tested for capacities far above their requirements before leaving our plant.

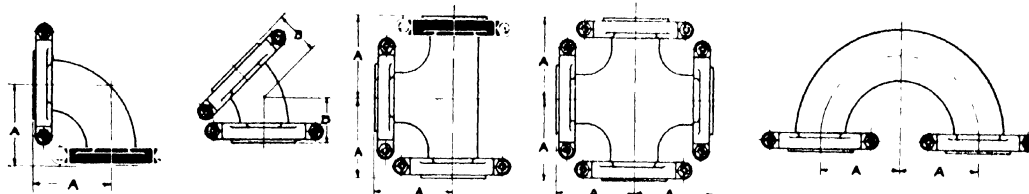
#### STANDARD DURIRON PIPE DATA

Inside dia. of pipe, inches	1	1½	2	2½	3	4	6	8	10	12
Wall thickness, inches	$\frac{1}{8}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{11}{16}$	$\frac{13}{16}$	$\frac{15}{16}$	1
Maximum dia. of Flange, inches	1½	2	2½	3	3½	4	5	6	8	10
Diameter of Gasket, inches	2¼	3¼	3¾	4½	5¼	6¼	7¼	8¼	10¼	11¼
Diameter of Bolt Circle, inches	3	3¾	4¾	5½	6	7½	9½	11¼	14¼	17
Diameter of Bolt Holes, inches	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1¼	1½	1¾	2¼	2¾
Number of Bolt Holes	4	4	4	4	4	4	4	4	4	4
Size of Bolts, inches	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1¼	1½	1¾	2
Weight per Foot Plain Pipe, lbs.	1½	6.1	8.9	10.8	15	19.4	32	54	80	130
Maximum Standard Length	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	5'-0"	5'-0"	6'-0"	6'-0"	6'-0"

Longer or shorter lengths than standard can be made special at increased cost per foot. Information on request.

#### STANDARD DURIRON PIPE FITTINGS

(Showing split Flanges in place on Fittings)



#### DIMENSIONS OF STANDARD SPLIT FLANGE FITTINGS

Size, inches	1	1½	2	2½	3	4	6	8	10	12
A—Center to face, inches	3½	4	4½	5	5½	6½	8	9	11	12
B—Center to face of 45° Ells, inches	4	4½	5	5½	6	7	8	9½	11½	13½
Maximum dia. of Flange, inches	1½	2	2½	3	3½	4	5	6	8	10
Number of Bolts	4	4	4	4	4	4	4	4	4	4
Size of Bolts, inches	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1¼	1½	1¾	2
Size of Bolt Holes, inches	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1¼	1½	1¾	2¼	2¾
Diameter of Bolt Circle, inches	3	3¾	4¾	5½	6	7½	9½	11¼	14¼	17

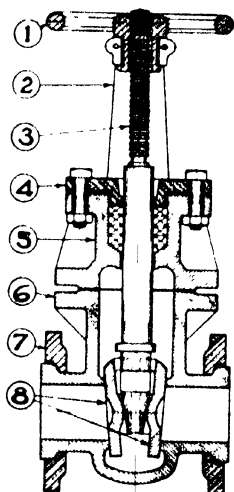
Above dimensions conform to U S 1912 Standard

If a combination fitting is desired, for example a tee with one flange, one bell and one plain end, or say, an elbow with one flange end, the other end plain, they may be furnished as required.

#### STANDARD DURIRON BELL AND SPIGOT PIPE DATA

SINGLE HUB						DOUBLE HUB					
Size	1½"	2"	3"	4"	6"	Size	1½"	2"	3"	4"	6"
Length of Joint	4'	4'	5'	5'	5'	Length of Joint	3'	4'	5'	5'	5'
Average Weight per Joint	22 lbs.	30 lbs.	53 lbs.	71 lbs.	136 lbs.	Average Weight per Joint	20 lbs.	34 lbs.	61 lbs.	81 lbs.	147 lbs.

Continued on Next Page

**DURIRON GATE VALVE**

1. Hand Wheel; 2. Yoke;  
3. Valve Stem; 4. Packing  
Gland; 5. Bonnet; 6. Valve  
Body; 7. Split Flange; 8.  
Valve Discs.

**DURIRON VALVES AND COCKS**

These are standard equipment for carrying corrosives. Careful accuracy of finish renders all parts interchangeable.

**DURIRON GATE VALVE**

The Duriron Gate Valve has been on the market for nearly two years, and tried out under all possible conditions where former equipment had proved unsatisfactory. There has been no complaint registered against the operation of this valve. In cases where it received extremely rough handling there was an occasional broken flange. This has now been overcome by split flange design.

**DURIRON GATE VALVES**

Size, Inches	Face to face of Flanges, Inches	Extreme overall height (open), Inches
1	5 1/4	14 1/4
1 1/2	7	20 1/4
2	7	21 1/4
3	8	28
4	9	30 1/2
6	13 1/4	41 1/2

**DURIRON PLUG COCKS**

The many years' service of Duriron Plug Cocks has proved their efficiency and the excellence of their design. Scores of thousands of these cocks in service bear witness to their universal usefulness in handling corrosives. Dimension table follows:

**STRAIGHTWAY PLUG COCKS**

Size, Inches	Face to face of Flanges, Inches	Size of bolt holes for block type, Inches
3/8	2 1/4	*
1/2	4 1/4	9/16
1	4 3/4	5/8
1 1/2	5 3/4	11/16
2	6 3/4	13/16
2 1/2	7 3/4	13/16
3	8 3/4	13/16
4	12 1/4	1

\* Block type only

Some users prefer to install cocks as a block, using two long bolts, clamping cock between pipe flanges. Size of hole for such two-bolt installation is shown in above table. For flange dimensions see Standard Pipe Data Table. Slots instead of holes are used for 3/4" and 1" sizes for flanged installation.

**THREE WAY COCKS**

Size, Inches	Face to face of opposite flanges, Inches	Center to face of side outlet flange, Inches
1	7	4 1/4
1 1/2	8	5
2	9	6
3	11	7 1/4
4	11 1/2	7 3/4

**CHECK VALVES**

Straightway or angle type, furnished in sizes of 1 1/2, 2, 3 and 4 inches.

**SAFETY VALVES**

Beam type, furnished in sizes of 1 and 2 inches. May be furnished armored for extremely high pressures.

**DURIRON PUMPS**

The two most important requisites of a chemical pump are resistance to corrosion and erosion.

Duriron has both to the highest degree, and is therefore, of itself, the ideal material for this type of apparatus.

Years of engineering development work in perfecting Duriron pumps mechanically to meet the peculiar requirements of corrosive pumping, has resulted in a line that is complete, and adapted to virtually any industrial process where acids are handled.

All parts of these pumps coming in contact with the solutions carried are of Duriron.

All parts are accurately finished to gauge, and are therefore interchangeable. Duriron pumps are all designed to render long service efficiently and with a minimum of attention. They are furnished either for belt drive or with special base for direct connected drive.

Duriron pumps are produced in standard sizes in the following types:

Reciprocating Plunger Pumps, single and duplex; for belt and steam drive.

Centrifugal Pumps, belt or motor drive. Furnished with motor complete if desired.

**We recommend that those interested write for Bulletins and detailed information, such as capacities, heads, H.P., etc.**

**Standard Pumps**

Centrifugal, 2" suction by 1 1/2" discharge

Centrifugal, 5" suction by 4" discharge

(Centrifugal pumps are produced in types for low and high head, and with closed and open impeller)

Reciprocating, 6" x 4" x 8", steam drive; and 4" x 8" gear drive

Reciprocating, 4" x 2" x 4" and 4" x 3" x 4", steam drive; and 2" x 4" and 3" x 4" gear drive.

**DURIRON EJECTORS**

Duriron Ejectors are designed to give the best efficiency possible for this type of apparatus, and, as in pumps, the extreme resistance both to corrosion and erosion assures an unlimited period of service.

Their jets are interchangeable, and they may be replaced without removing the Ejector from line. Special jets to fit the standard body are supplied.

**TABLE OF DIMENSIONS, DURIRON EJECTORS**

Standard Size	Flanged Connections		Overall length	Suction flange to center line
	Steam	Suction & delivery		
1"	1"	1"	6 1/2"	3"
1 1/2"	1 1/2"	1 1/2"	7 3/4"	3 9/16"
2"	1 1/2"	2"	9 7/16"	4 3/8"
2 1/2"	2"	2 1/2"	12 1/4"	4 15/16"

**DURIRON EXHAUST FANS**

Duriron Exhaust Fans handle corrosive vapors with the same facility that Duriron pumps carry corrosive liquids, and their sturdy construction permits higher speeds than similar apparatus of other materials, thus giving much higher efficiency.

They are produced in four standard sizes: 3" suction and exhaust; 4" suction and exhaust; 8" suction and exhaust, and 12" suction and exhaust. The three larger sizes may be furnished either for belt drive or for direct connection to motor. The 3" size is furnished only with motor (1/6 H.P.) complete.

Bulletin giving capacities and all data mailed on request.

*Continued on Next Page*

## DURIRON KETTLES

Grouped under the term "kettle" is apparatus which may be known to the user as Nitrator, Sulphonator, Hydrogenator, Acetylator, Still, Evaporator, Mixing or Cooking Kettle.

The Duriron line of this apparatus is most complete, ranging from an experimental laboratory size of one gallon capacity (which is furnished complete with jacket, stirrer and drive) to those of a thousand gallons capacity. These are of different types, and are equipped with a wide variety of openings, outlets, jackets, agitators, etc., to meet the different uses required of them.

Our long experience in producing kettles has resulted in a standard line that, by minor modifications, may be utilized for virtually any chemical process, and this standardizing of design assures the customer of a saving in pattern costs and in time of delivery.

Duriron kettles are usually heated by using a steam jacket or oil bath.

In smaller sizes direct heat may be used when proper setting is provided and a uniform temperature is maintained.

Stirrers, Agitators and Scrapers of all types are produced to take care of any operation that may be required. Boiler plate and cast iron jackets furnished.

Our bulletin on kettles gives much data and illustrates our standard design.

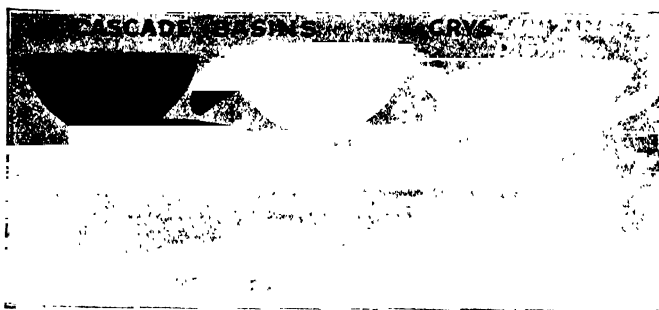
We also gladly cooperate in advising methods of accomplishing new processes where our kettle apparatus is necessary, and the experience gained by a wide diversity of development makes our counsel valuable.

## DURIRON NITRIC ACID CONDENSER

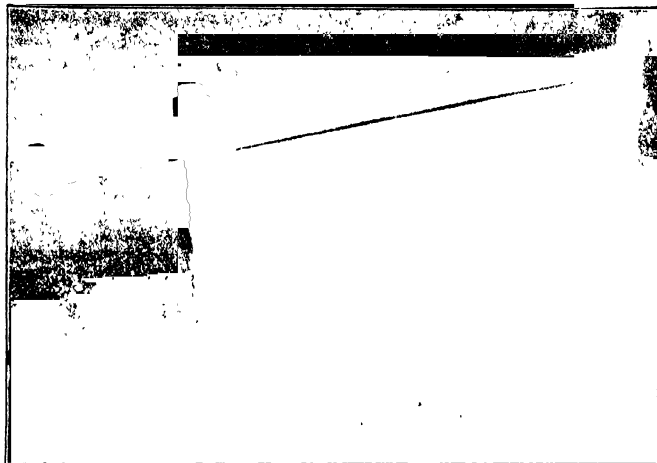
The complete Duriron Nitric Condenser has long enjoyed the reputation of being the most efficient and desirable apparatus obtainable for the condensation of acid vapors.

## DURIRON CASCADE SYSTEM

In the concentration of sulphuric acid by the cascade system, Duriron equipment has proven itself more satisfactory, efficient and economical than any other material. All the necessary parts for a complete installation have been made standard apparatus and basins and pans are stocked for immediate shipment.



DURIRON LABORATORY DISHES



DURIRON RADIATION UNIT

We have most complete data on performance of Duriron cascade systems, and this may be had upon application.

## DURIRON DENITRATING SYSTEM

Complete denitrating systems from standard Duriron patterns are furnished.

## DURIRON "S" BEND CONDENSER TUBES

Standard Duriron Condenser Tubes and connections, "S" Bend type, in sizes from 1 1/4" to 8" inside diameter. We can also furnish Condensers complete with cast iron water jacket. Laboratory Condenser for experimental work.

## DURIRON LABORATORY EQUIPMENT

The universal resistance of Duriron to corrosives used commercially and in experimental research, as well as its ability to withstand high temperatures, renders it of great value for laboratory utensils and equipment. Its value in the laboratory in research and experimental work is this: any process carried out in Duriron may then be produced in commercial quantity in Duriron units of commercial size capacity with exactly similar results.

## DURIRON RADIATION UNIT

The Duriron Radiation Unit for submerged service is made up of "S" Bends so designed that they afford a maximum surface for heating or cooling, while occupying a minimum space. Corrosives may be handled either inside or outside without coming in contact with other metal than Duriron. Steam may also be used for heating. Individual members are interchangeable, and great flexibility as to number of members and position of installing is possible.

## THE DURIRON POLICY

It is the fixed policy of The Duriron Company to recommend the adoption of Duriron only when convinced that it will serve the purpose better than any other material.

# EASTON CAR AND CONSTRUCTION CO.

EASTON



Complete Industrial, Plantation, Contractors and  
Portable Railway Equipment

191 FULTON STREET, NEW YORK, N. Y.

WORKS EASTON, PA.

## PRODUCTS

Cars (for every industrial purpose)  
Rails and Portable Track  
Switches, Permanent and Portable  
Turntables, Crossings  
Wheels and Axles.

This space permits of only a bare summary of the wide and complete variety of Easton industrial railway equipment. Full specifications and additional and larger illustrations will gladly be sent to supplement these small cuts.

This company designs and builds narrow-gage railways complete, for all industrial purposes: contracting operations, factories, yards, warehouses, plantations, docks, power plants, quarries, etc. It furnishes everything required for a complete installation, either to its own or to customer's drawings and specifications: cars, rails and accessories, locomotives, switches, frogs, turntables, etc.

The benefit of thirty years' experience is to be had for the asking.

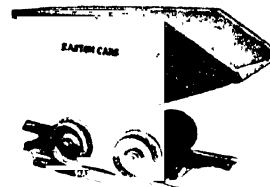


Fig. 5139

STANDARD SCOOP CAR

Code Word	Capacity	Track Gauge	Body		Height overall	Length Sweep End	Wheel Rise	Axles	Wheels	Frame Channel	Plates	Weight lbs.
			Length	Depth								
Sporcheyza	18	18"	1'-11"	2'-0"	3'-5"	2'-4"	20"	13"	10"	6"	1"	540
Sporisort	18	24"	"	"	3'-5"	2'-4"	"	13"	10"	"	"	550
Sporobole	18	30"	"	"	3'-7"	2'-6"	"	13"	10"	"	"	570
Spora	18	36"	"	"	3'-7"	2'-6"	"	13"	10"	"	"	580
Sporocarp	27	18"	"	"	3'-6"	2'-5"	"	13"	12"	"	"	700
Sporatome	27	24"	"	"	3'-6"	2'-5"	"	13"	12"	"	"	710
Sportfully	27	30"	"	"	3'-8"	2'-5"	"	13"	12"	"	"	730
Sport	27	36"	"	"	3'-8"	2'-5"	"	13"	12"	"	"	700

Note—Table gives the rated capacity figured with heaped load



Fig. 501

STANDARD ROCKER DUMP CAR

Code word	Capacity	General Dimensions				Body				Running Gear	Weight lbs.
		Length overall	Width overall	Height overall	Loading height	Throw of body	Wheel base	Length inside	Width inside		
Rate	18	21'	6'-8"	3'-11"	2'-9"	2'-0"	2'-0"	4'-2"	3'-8"	12"	900
Late	27	24'	7'-3"	4'-5"	2'-10"	2'-11"	2'-1"	4'-0"	4'-2"	12"	1000
Gate	27	24'	7'-3"	4'-5"	3'-11"	3'-4"	2'-4"	4'-0"	4'-2"	12"	1075
Rate	40	24'	8'-0"	5'-4"	4'-6"	2'-7"	2'-31/2"	2'-6"	5'-0"	14"	1425
Rate	40	24'	8'-0"	5'-4"	4'-7"	3'-0"	2'-61/2"	2'-6"	5'-0"	14"	1475
Late	40	24'	8'-0"	5'-4"	4'-8"	3'-0"	2'-8"	2'-6"	5'-0"	14"	1525
Mate	54	30'	8'-8"	5'-10"	4'-10"	3'-0"	2'-71/2"	2'-6"	5'-6"	14"	1750
Late	54	30'	8'-8"	5'-10"	4'-11"	3'-0"	2'-9"	2'-6"	5'-6"	14"	1790



Fig. 91

STANDARD CAST-IRON BALL-BEARING TURNTABLE WITH AUTOMATIC LOCKING DEVICE

Diameter of Top	40"	44"	48"	52"	60"	72"	84"
Track Space	41 1/2"	45 1/2"	49 1/2"	53 1/2"	61 1/2"	73 1/2"	85 1/2"
Capacity (Tons)	3	4	4	6	6	7	8
Standard Gauge	20"	21"	24"	24"	24"	24"	24"
Weight, lbs.	700	800	1,150	1,275	1,675	2,800	3,400
Code Word	Revolver	Revolving	Revolution	Revotaba	Revuelto	Revue	Revulsarum

Turntables 44" to 84" will also fit 24" outside track gauge. Other gages than standard can be furnished at a slight additional cost.

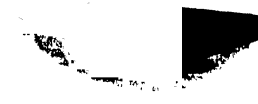


Fig. 1005

STANDARD PLATFORM CAR

Code	Platform Dimensions				Frame Channel	Wheel Rise	Track Gauge	Floor	Capacity in Tons	Weight
	Length	Width	Height	Wheels						
Stohorum	4'-0"	3'-0"	15"	12"	13"	5"	20"	14"	2.3	1
Starbetta	5'-0"	3'-4"	15"	12"	13"	5"	24"	14"	2.3	1
Stockblind	6'-0"	4'-0"	15"	12"	13"	5"	24"	14"	2.3	1
Saber	6'-0"	4'-0"	18"	14"	22"	6"	30"	14"	5	1
Sable	8'-0"	4'-6"	19"	16"	21"	6"	42"	14"	5	1
Saccharine	12'-0"	6'-0"	22"	16"	22"	7"	48"	14"	6	2



Fig. 73

STANDARD COAL CHARGING CAR

Capacity	1/2 ton	1 ton	1 1/2 ton
Gage	24"	24"	24"
Code Word	Trackfuss	Trackung	Trackler
Body length inside	4'-6"	5'-0"	6'-0"
Body width inside	3'-4"	3'-10"	4'-0"
Body depth inside	1'-0"	2'-0"	2'-6"
Overall height	3'-8"	3'-8"	4'-5"
Height to floor	1'-6"	1'-8"	1'-8"
Plates	1"	1"	1"
Wheels	12"	14"	14"
Weight	750 lbs.	1000 lbs.	1300 lbs.

Continued on Next Page



Fig. 1543

**SPECIAL HOPPER BOTTOM CAR**  
Built of steel and wood instead of the usual all steel construction. A number of designs of all steel Hopper Bottom Cars are shown in Illustrated Bulletin No. 7

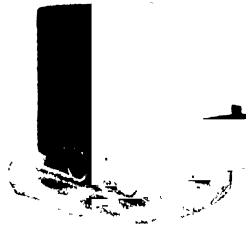


Fig. 622

**SPECIAL ROCKER DUMP CARS**  
These are designed and built to meet any specifications or conditions, and are made either side or end dump



Fig. 435

**GABLE BOTTOM CAR**  
We build all types in standard and special designs with and without brakes, the smaller sizes being 4 wheel construction and the larger sizes double track, or 8 wheel construction



Fig. 371

**ROCKER DUMP CAR**  
Special for locomotive traction. These large cars are made in any capacity or design, for any track gauge and either with or without brakes and automatic couplers



Fig. 276

**STANDARD GRADLE DUMP CAR WITH BRAKE**

Also built to dump endwise or all around. Standards in stock.

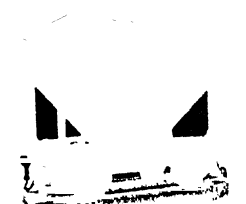


Fig. 144

**EXTRA HEAVY CENTER DISCHARGE HOPPER CARS WITH DROP DOORS**

One of many types



Fig. 370

**ROCKER DUMP TRAILER**  
With extra wide tired wheels for uneven soft ground, used in connection with tractors

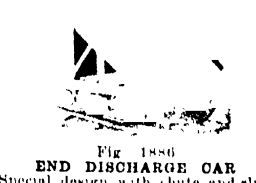


Fig. 1886

**END DISCHARGE CAR**  
Special design with chute and sliding gate. Other End Discharge Cars are shown in Illustrated Bulletin No. 7



Fig. 2665

**TURNTABLE**

Built for carrying 35-ton locomotive crane on standard gauge track. Steel top covers entire pit

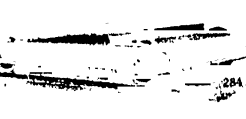


Fig. 284

**TRANSFER CARS**

Built in a number of designs, many of them being underslung, so the load platform is very close to the ground



Fig. 1184

**EASTON ANNEALING FURNACE CAR**

Widely used in steel mills, foundries, automobile and other factories where annealing and heat treating of castings, chains, forgings, etc., is a part of the manufacturing process



Fig. 2246

**CHARGING BOX CAR**  
Capacity 10 tons, gauge 4 ft. 8 1/2 in., length 10 ft. 6 in., width 6 ft. 3 1/2 in. We build all types of Charging Box Cars in standard and special designs



Fig. 135

**CROSSING**

Of any design, angle, gauge, or weight of rail



Fig. 185

**CAST IRON PLATE SWITCH AND CAST IRON PLATE TRACK**  
For boiler rooms, power plants, etc



Fig. 269

**ALL-STEEL SKIP CAR**  
Built in various designs and to meet special requirements



Fig. 191

**LOCOMOTIVE**  
Gasoline and oil burning steam, 3-12 ton, any gauge



Fig. 77

**PORTABLE TRACK ON STEEL TIES**

Of any gauge and weight of rail



Fig. 80

**PORTABLE SWITCHES WITH OR WITHOUT STEEL TIES**  
All gauges and weights of rail

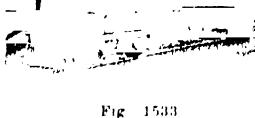


Fig. 1533

**SPECIAL DOUBLE TRUCK PLATFORM CAR**

Built to meet any specific requirements and in any desired size. Both with and without brakes

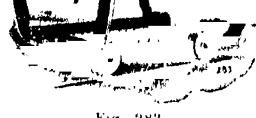


Fig. 283

**CREOSOTING CAR**  
One of the many types we build



Fig. 448

**WHEELS AND AXLE**

Of any design and for all gauges



Fig. 87

**ROLLER IN HUB WHEELS ON SQUARE AXLES**



Fig. 1542

**PLATFORM CAR**  
Same as standard platform car, Fig. 1005, except equipped with stake pockets and stakes



Fig. 408

**ROTARY DUMP MINE CAR**  
Designed especially for mine work, in tunnels and other services where small over-all dimensions are an important feature

# ECLIPSE AIR BRUSH COMPANY

Manufacturers of Low Pressure Pneumatic Painting Equipment

79 ORANGE STREET, NEWARK, N. J.

## PRODUCTS

Air Brushes  
Pneumatic Painting Equipment  
Sprayers  
Lacquer Sprayers  
Varnish Sprayers

## ECLIPSE PNEUMATIC PAINTING EQUIPMENT

Easily cleaned. Paint can be forced back into the container without disconnecting. Thinner can be run through the machine without using spraying pressure and without loss. Durably constructed. Practically no upkeep cost. Perfect regulation of flow of material, separate from atomizing pressure. Non-corrodible throughout. Straight-side paint container, hot-galvanized, with handles welded to sides—Cone shaped nozzle for irregular surfaces and fan-shaped nozzle for wide, flat work.

## MODEL "G" AND MODEL "F"

The Model "G," or gun-type, for heavy, fast work or where a large quantity of material is used. Made in 5 and 15 gallon sizes.

The Model "F," or attached-container type, for fine finishing work where the colors are frequently changed and for the application of lacquers, bronzing materials, insulating varnishes, etc. Made in pint, pint and a half and quart sizes.



MODEL "G"

## LOW PRESSURE

Low pressure eliminates objectionable fumes; applies materials as compounded, without air reduction

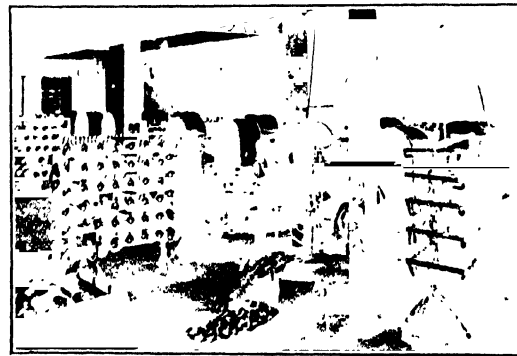


ECLIPSE PAINTING EQUIPMENT IN USE

taking place or the removal of the adherent and coherent qualities; materials are not chilled in the application.

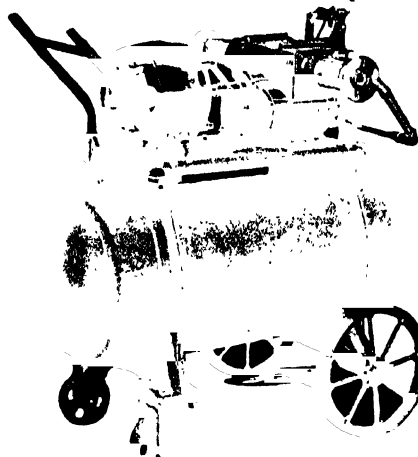
## ECLIPSE EXHAUST EQUIPMENT

Designed and constructed in accordance with the rules of Department of Labor, Board of Fire Underwriters, Bureau of Hygiene and Sanitation. Cast aluminum, non-abrasive, propeller-type of fan used. Motor located outside of vapor-duct and cannot come in contact with fumes.



ECLIPSE EXHAUST EQUIPMENT

## PORTABLE PAINTING EQUIPMENT



PORTABLE PAINTING EQUIPMENT

For interior and exterior maintenance work. One Air Brush operator will accomplish as much in one hour as a hand or bristle-brush worker will in a day. All the dipping and dripping is done away with and the cost of bristle brushes saved.

Portable electrically-driven air compressing units in any capacity. The Low Pressure Model "G," because of its low air consumption, can be operated from a direct connected, electrically-driven compressor with  $\frac{1}{2}$  H.P. motor.

Two-brush compressor, as shown in the cut, uses but  $\frac{3}{4}$  H.P. motor.

## GUARANTEE

The Eclipse Air Brush is guaranteed to you against defective workmanship and material and to give you better results than can be obtained with any other device or method.



## EIMER & AMEND

Headquarters for Assay, Bacteriological and Chemical Laboratory  
Apparatus of all Kinds, Also for Chemical Reagents,  
Drugs, Minerals and Stains

Third Ave., 18th to 19th Sts.  
NEW YORK, N. Y.

PITTSBURGH OFFICE  
1018 Jenkins Arcade

### PRODUCTS

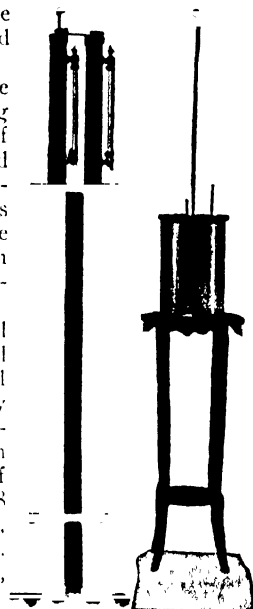
Chemical Laboratory Apparatus of all kinds, especially for Industrial, Testing, and Bacteriological Laboratories, also Chemicals, Drugs, Minerals, Stains, and Tested Purity Reagents.

#### BINGHAM AND GREEN VISCOMETER AND PLASTOMETER SIMPLIFIED FORM

Especially intended for the testing of Paints, Oils and Varnishes.

This apparatus can be used, however, for testing the viscosity of any form of liquid, besides being adapted for determining the plasticity of all plastic materials for which the initial pressure required is not more than that of a 10 foot water column.

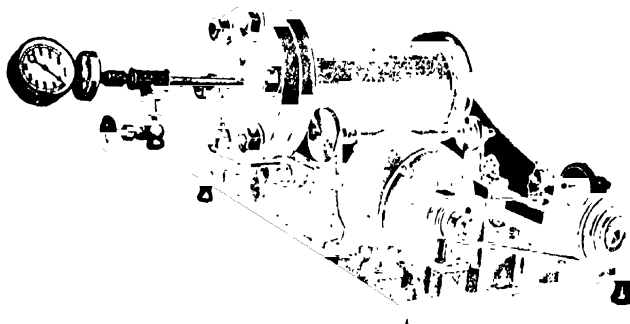
For information in regard to auxiliary apparatus, and for details of the original complete outfit as regularly used in exact scientific research, see E. & A. Bulletin No. 277, also Bureau of Standards Bulletins Nos. 278 and 298, Proc. of A.S.T.M., Vols. 18 and 19; also Jour. of Amer. Chem. Soc. Vol. 38, P. 40, 1916, etc.



BINGHAM & GREEN  
VISCOMETER AND PLAS-  
TOMETER

#### BROOKS ROTATING AUTOCLAVE

Specially adapted for laboratory work. Stirring by rotation prevents local overheating. The autoclave is especially adapted for reaction mixtures, containing much solid matter as salts, etc. There is no stuffing box to develop leaks. Direct heating, made possible by rotation, gives maximum temperature range. There is no bother with steam connections, nor hot oil jackets with their carbonization trouble and fire hazard. The autoclave is light, compact and port-



BROOKS ROTATING AUTOCLAVE

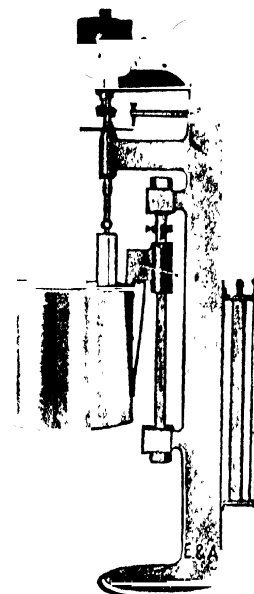
able. An electric light socket and a gas burner are all the requirements needed.

The autoclave is provided with pressure gauge to 500 pounds with special silver diaphragm connection, thus precluding injury to the spring coil of the gauge from corrosion or clogging. Special linings are supplied to meet requirements.

#### OIL EMULSION APPARATUS FOR THE DEMULSIBILITY TEST U. S. NAVAL STATION DESIGN IMPROVED BY E. AND A.

The Bath maintains the contents of the graduated cylinder at a temperature of 55°C. There is a special stirrer, with motor and governor, for maintaining a constant speed of 1500 R.P.M.

E. and A. improvements are the arrangement whereby the bath moves up and down instead of the motor, and the governor for the motor. The apparatus is furnished complete with motor, governor, stirrer, electric heating arrangement and 6 cylinders.



OIL EMULSION APPARATUS

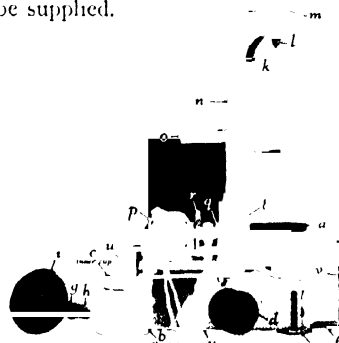
#### MACMICHAEL VISCOSIMETER

Recommended for the testing of oils, varnishes, glues and similar materials.

The viscosity range is from that of the lightest liquid up to that of the heaviest glue. The instrument is portable and rugged in construction.

Technical training is not required to operate. The motor is universal for A.C. or D.C.

In ordering advise voltage, also approximate viscosity of materials to be tested, so that suitable torsion wires may be supplied.



MACMICHAEL VISCOSIMETER

# ELECTRIC HEATING APPARATUS COMPANY

Regularly carried in stock by  
 Emer and Amend  
 New York Pittsburgh  
 Braun Knecht Heimann Co  
 San Francisco  
 The Braun Corporation  
 Los Angeles  
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 Montreal

## Electric Furnaces and Heat Appliances

BRANCH OFFICE

25 Church Street  
 NEW YORK, N. Y.

GENERAL OFFICE AND FACTORY

18 to 34 Nesbitt Street  
 (Formerly 123-125 Sussex Ave.)  
 NEWARK N. J.

Regularly carried in stock by  
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 Philadelphia  
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 Central Scientific Co., Chicago  
 Canadian Laboratories Sup-  
 plies, Ltd., Toronto  
 Denver Fire Clay Co., Denver

### PRODUCTS

Multiple Unit Furnaces; "Hevi-Duty" Furnaces;  
 Multiple Unit Electric Furnaces for Organic Combus-  
 tions; Electric Hot Plates; Flask Heaters, Etc.

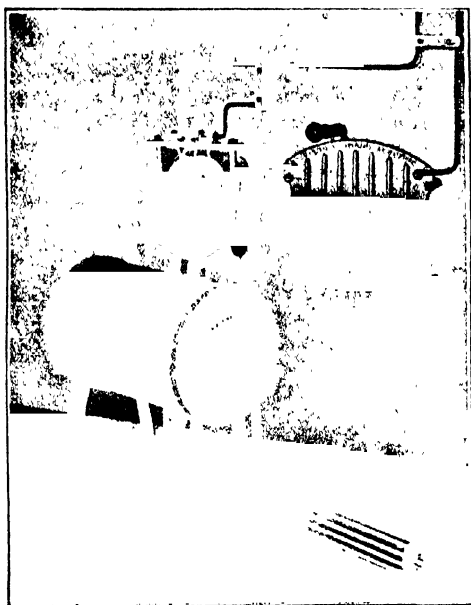
### HEVI-DUTY ELECTRIC FURNACES, MUFFLE TUBE, CRUCIBLE TYPES: MADE IN ANY SIZE

May be operated continuously at 2000°F. (1100°C.)  
 Operate on low voltage and therefore preferably on  
 A. C. through transformer. Return bend coils of the  
 heating elements are of large diameter wire.



Low voltage furnaces nearest "Hevi-Duty" in effi-  
 ciency require about 45% more energy to reach  
 1100°C. and average in excess of 175% more energy  
 operating at normal working temperatures.

At maximum temperatures "Hevi-Duty" furnaces  
 maintain 1100°C. with an average of 35.9% of their  
 full load ratings, leaving 64.1% available for useful  
 heat work. No other furnaces equal this efficiency.  
 The durable construction and workmanship of "Hevi-  
 Duty" furnaces are on a par with their efficiency and  
 economy.

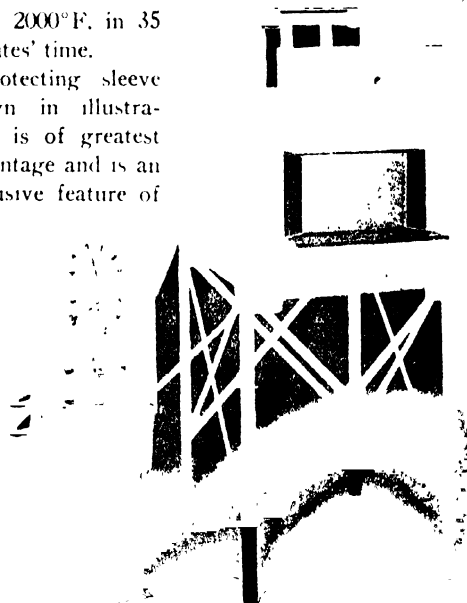


**TYPE HD99 SINGLE TUBE COMBUSTION FURNACE**

Complete with transformer and regulating rheostat. Spare pro-  
 tecting sleeve and return bend coil shown in right hand lower corner.  
 Size inside 1 1/4" x 10". Tube center 10" from bench. Made also  
 for five tubes in one furnace.

This furnace is the most economical of all electric  
 combustion tube furnaces. Operating at 2000°F.,  
 1900°F., 1800°F. and at 1600°F., the furnace consumes  
 430 watts, 375, 325 and 240 watts, respectively, per  
 hour. It has a maximum demand of 7/10 K.W., at-  
 tains 2000°F. in 35  
 minutes' time.

Protecting sleeve  
 shown in illustra-  
 tion is of greatest  
 advantage and is an  
 exclusive feature of

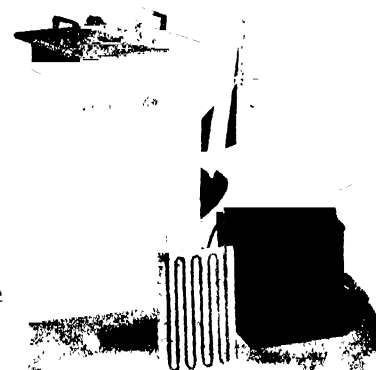


**HEVI-DUTY MUFFLE FURNACE**

Made in six sizes, from 4" wide, 3" high, 10" deep for bench use  
 up to 12" x 8" x 36" with steel stands for floor use

the "Hevi-Duty" furnace; it diffuses  
 the heat, thus insuring absolute uni-  
 formity of temperature; offers great  
 protection against oxidation of the  
 heating ele-  
 ment; and pre-  
 vents short cir-  
 cuiting of the  
 coil by means  
 of bare ele-  
 ments of the  
 thermo couple,  
 such as is usu-  
 ally used in  
 furnaces of this  
 type.

Catalog "E"  
 gives complete  
 details of  
 "Hevi - Duty"  
 furnaces.



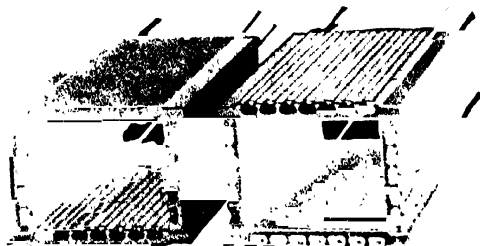
**CRUCIBLE FURNACE**

Hevi-Duty crucible furnaces are made in three  
 sizes, 4" square 6" deep, up to 10" square 14"  
 deep

*Continued on Next Page*

### MULTIPLE UNIT ELECTRIC FURNACES, MUFFLE, CRUCIBLE, TUBE TYPES

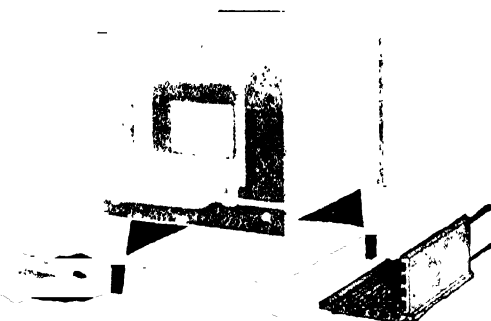
Multiple Replaceable Unit System.



MUFFLE UNITS ARE REVERSIBLE

By means of the Multiple Unit feature of this system, all parts containing the Heat Producing Resistor Coils are independently inserted into the furnace chamber to form a complete Muffle, Crucible or Tube form. Being wholly contained in the heating chamber all heat generated is effective, making the efficiency higher than in any other electric furnace.

The Multiple Unit System is patented. Enables the operator to remove the one unit which may have burnt out, thus leaving the other unit or units in the furnace for further service. Any unit, in case of a burnout in the Multiple Unit System, can be easily replaced in five minutes' time by the operator.



STANDARD MUFFLE FURNACE

Types 50, 52, 54 and 56, with one each "Spare" Top (or Bottom) and Side Units. Sizes are  $3\frac{1}{2}$ " wide,  $2\frac{1}{2}$ " high, 7" deep inside,  $4\frac{1}{4}$ " x  $3\frac{1}{2}$ " x  $10\frac{1}{2}$ ",  $5\frac{1}{4}$ " x  $3\frac{1}{2}$ " x  $12\frac{1}{2}$ ", and  $7\frac{1}{2}$ " x  $5\frac{1}{4}$ " x  $14\frac{1}{2}$ ". Incased Rheostat Muffle Furnaces, Types 60 to 66, are same sizes as above but have rheostat incased in base of furnaces (not illustrated).

### COMBUSTION TUBE FURNACES

Furnaces of this type, while designed primarily for combustion work, have been used extensively for enameling or hardening tubes, rods, helical springs, etc., and for Pyrometer Calibration.

Hinged combustion furnace, type 70, not illustrated, is hinged so the upper half may be raised for observation, similar to the Organic design illustrated in next column.

Size of each type  $1\frac{1}{4}$ " diameter x 12" bore.

STANDARD COMBUSTION TUBE FURNACE, TYPE 77  
Shown with one "spare" unit

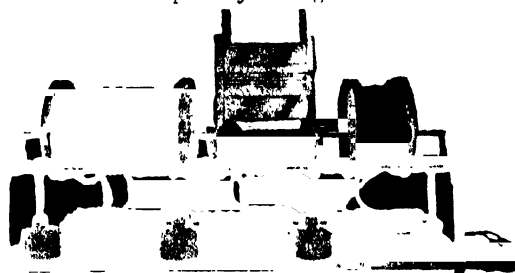
### CRUCIBLE FURNACES (not illustrated)

This form of furnace is used extensively for melting small quantities of base metals; for *pyrometer calibration when couples are immersed in molten salts or metals*; and for Decalescent Work in Steel.

Catalog "C" describes Multiple Unit Furnaces.

### MULTIPLE UNIT ELECTRIC ORGANIC COMBUSTION FURNACE

This apparatus has been designed to replace oil or gas fired furnaces especially for organic combustions.



ORGANIC COMBUSTION FURNACE

**Advantages**—Each section of the electric furnace, during any one combustion, is used independently in place of groups of Bunsen Burners. Each section is easily moved along the rails to provide for combustion at different points, instead of the use of additional burners of the gas type. The individual switches and rheostats mounted on the base afford a means of operating each furnace independently.

For observation purposes the upper half may be raised without shutting off the heat, exposing the glass combustion tube. No fumes are present. Effective heat insulation. Quickly responsive to all conditions of quick or slow heating or cooling.

The use of this furnace is described in Dr. H. L. Fischer's "Laboratory Manual of Organic Chemistry."

Catalog "B" details the Organic Furnace.

### MULTIPLE REPLACEABLE-UNIT HOT PLATES

750° F (400° C.) Maximum 160° F. (71°C) Minimum

Compared on a basis of *equal area of Heating Surface and Temperature*, the "next best" use 16.63% more current than "Multiple Unit" Hot Plates.

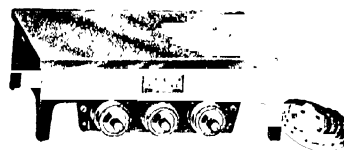
Give temperatures twenty-five per cent, higher than other makes with equivalent current; give the same temperature with fourteen per cent, less current. The units are readily renewable by the operator.

**Construction**—Steel Bases and Cast Iron Tops. Bases finished in "Optical Black." Top Plate polished surface. Units, two or four in each plate, are moulded "Electrobestos," grooved to receive the heating elements, which are imbedded in a refractory cement. Top plate rests on the units, free from contact with the base, which obviates the loss of heat by conduction. The units rest on bricks of low thermal conductivity, having a conductivity of about one-tenth that of ordinary fire bricks. This forces to the top of the plate a maximum amount of heat generated and affords a comparatively cool atmosphere to the under side of the apparatus. The increased efficiency is a net saving in current cost; gives higher temperatures and quicker maximum heats.

When the Three-Heat Hot Plate is used on 110 volts, the connector plug at the rear may be shifted to the connector pins designed for 220 volts.

This "Shifted Voltage" gives an additional three heats, making the Hot Plate readily desirable for alcohol extractions, ether evaporation and such similar low temperature work. Similarly, the One-Heat type gives two heats when used on "Shifted Voltage."

Catalog "A" details Hot Plates.



MULTIPLE UNIT HOT PLATE

Sizes  $4\frac{1}{2}$ " x  $24\frac{1}{2}$ ",  $6\frac{1}{2}$ " x  $18\frac{1}{2}$ ",  $12\frac{1}{2}$ " x  $12\frac{1}{2}$ ",  $12\frac{1}{2}$ " x  $18\frac{1}{2}$ " and  $18\frac{1}{2}$ " x  $24\frac{1}{2}$ ", with switches on  $12\frac{1}{2}$ ",  $18\frac{1}{2}$ " or  $24\frac{1}{2}$ " edge as may be most suited to benches or hoods.

# ELECTRO-CHEMICAL SUPPLY AND ENGINEERING COMPANY

320 Bulletin Building  
PHILADELPHIA, PA.

Cable Address: ECSEC, Philadelphia

## PRODUCTS

The Vorce Electrolytic Cell.  
Processes for the Production of Lime or Soda  
Bleaching Liquors.  
Electrolytic Installations.  
Chemical Plants and Acid Plants.  
DURO Acid-Proof Cement and Brick.

### THE VORCE ELECTROLYTIC CELL

The Vorce cell is for the production of Caustic Soda or Potash, Chlorine Gas, and Hydrogen in the manufacture of Lime or soda bleaching liquors, bleaching powder, liquid chlorine, Hydrochloric acid, caustic in any form, lard substitutes, and chlorine products.

Some advantages:

1. Extreme Simplicity of construction of all parts resulting in very low costs of construction and upkeep.
2. Small compass, resulting in large production in small floor space, and low cost for housing. One cell of 1000 amperes capacity requires only 15 square feet of active floor space including alleyways and space between cells.



TYPICAL INSTALLATION OF VORCE CELLS

3. Anode construction is such that electrical contact with non-jointed graphite anode is made outside the cell and above the brine level, preventing fouling of the contacts. This joint is accessible for inspection and cleaning, without interrupting cell operation. The direct result is high efficiency and long life of the anode.

4. Current efficiency.....93% to 98%.
5. Light weight.....only 600 lbs. per cell.
6. Very low operating cost.

In pulp mills and textile bleacheries, bleaching solutions may be economically produced which are superior to solutions of bleaching powder.

### DURO ACID-PROOF CEMENT

Duro is a fine white powder to be mixed with silicate of soda to the consistency of soft putty. In this form it is ready for use as a cement for laying up acid brick and for other purposes. Duro constructed masonry is found superior to lead for many uses about a chemical plant

Common uses are:

- Acid Towers,  
Gay-Lussac, Glover, Concentrating, Purifying,  
Absorbing.
- Acid Tanks,  
Storage, mixing, leaching.
- Acid  
Coolers, filters, chutes, fan-casings, chamber  
floors.
- Any Acid-Proof Construction.

### SERVICES

We are specialists in the design and construction of plants for the manufacture of:

- |  |                        |
|--|------------------------|
| Sulphuric acid                         | Liquid Sulphur Dioxide |
| Hydrochloric acid                      | Liquid Chlorine        |
| Nitric acid                            | Potash Products        |
| Phosphoric acid                        | Chlorine Products      |
| Electrolytic caustic soda and chlorine |                        |
| Electrolytic copper and zinc.          |                        |

### CONSULTING SERVICE

We act as consulting engineers in general plant operation, where so desired advising as to the most economical design and general plant efficiency.

Our experience in design, construction, and operation of chemical plants and apparatus will be valuable in the reconstruction of plants now in operation as well as for contemplated projects.

# THE ELECTROLABS COMPANY

BRANCHES  
New York  
Philadelphia  
San Francisco  
Los Angeles

2635 Penn Avenue  
PITTSBURGH, PA.

Cable Address  
"ELECTROLAB"  
Pittsburgh

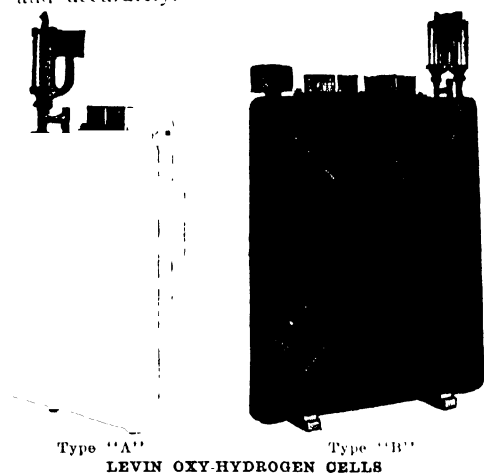
**Electrolabs**

## PRODUCTS

Equipment for complete Oxygen and Hydrogen Generating Plants.

### LEVIN OXY-HYDROGEN GENERATOR

**Construction**—Is of the unit type, being built of a few standardized parts which can be assembled rapidly and accurately.



This generator is distinctive in that it is delivered completely assembled and rigidly welded.

The cell consists of three compartments:

Two outer compartments in which oxygen is generated, and a central one in which hydrogen is generated; two sheet metal frames, to each of which is attached an asbestos diaphragm, serve as separating mediums.

The electrodes are independent of the casing, being separated from and securely fixed within it by specially designed blocks of asbestos. The surfaces of both the anode and cathode are cobalt-plated.

All sheet metal used is iron of the highest purity.

**Applications**—The Levin Oxy-hydrogen generator is suitable for use wherever a supply of oxygen, hydrogen or both of these gases is required.

The Electrolabs System produces oxygen at one-third the price paid for it in cylinders, and in addition furnishes hydrogen as a by-product. This is a conservative estimate in which storage, handling, return of cylinders, bookkeeping, unavoidable 15% loss, etc., have not been included.

**Technical Advantages**—Some of the features of design and construction that bring about simplicity of routine, freedom from interruption in operation, and efficiency of the generators are:

All materials likely to deteriorate under action of the strong caustic solution (electrolyte), the gases formed, or the electrochemical action consequent upon the decomposition of water have been entirely excluded. This insures the durability of the generator, reduces maintenance and rehabilitation expenses and

results in a continuous, efficient, and safe functioning. It is this exclusion of deteriorating materials that makes it possible for "Electrolabs" to manufacture a perfect generator.

There are no packing joints, no expenses for maintenance and replacement of packing materials, no bolts to insulate and no leaks to remedy.

**Safety**—Safety features have received special attention. **The hydrogen and oxygen can not become mixed.** This is evidenced by reports from various installations which show the purity of each of the gases direct from the generator to be 99.8% and better.

## REFERENCES

We are pleased to refer those interested in the generation of oxygen and hydrogen gas to the following plants where repeat orders have enlarged original installations

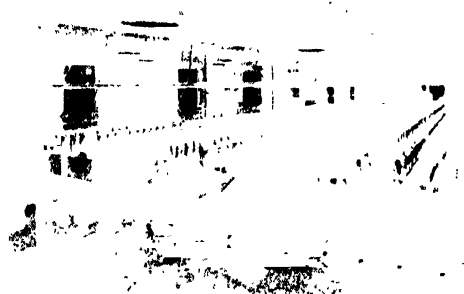
Portland Oxygen and Hydrogen Co., Portland, Oregon—trebled  
Cleveland Wire Division of General Electric Co., Cleveland, O., doubled original plant in last two years  
General Electric Co., Erie, Pa.—trebled in two years  
Bettendorf Oxygen Hydrogen Co., Bettendorf, Iowa—increased from 100 to 414 cells  
Paschall Oxygen Co., Philadelphia, Pa., increased from 800 to 1200  
Ohio Chemical & Mfg Co., Cleveland, Ohio—doubled  
Consolidated Rolling Mills & Foundries Co., Mexico—doubled

## SERVICES

We take the entire responsibility of designing and installing complete plants. The floor space required is no greater than that hitherto required to store cylinders.

A large force of engineers and large manufacturing facilities enable us to guarantee reasonably prompt deliveries of equipment.

We shall be pleased to consult regarding the problems of production and the use of oxygen and hydrogen with anyone desirous of an economical and reliable source of supply. Our experience is at your service.



414 LEVIN CELL INSTALLATION

Bettendorf Oxygen Hydrogen Co., Bettendorf, Iowa. Four repeat orders more than quadrupled the original 100 cell installation.

# ELECTRON CHEMICAL COMPANY

Allen-Moore Electrolytic Cells  
531 CONGRESS ST., PORTLAND, ME.

IN FOREIGN COUNTRIES

## ALLEN ELECTROLYTIC CELL CORPORATION

GENERAL EUROPEAN REPRESENTATIVE—Wallace H. Phillips, 9 Grosvenor Gardens, London, S. W. 1  
AGENTS FOR FRANCE, BELGIUM, ITALY AND SPAIN—Phillips & Poin, 1 Rue Taillout, Paris

### PRODUCTS

Allen-Moore Electrolytic Cell for the manufacture of Chlorine and Caustic Soda.

Complete Electrolytic Chlorine Plants.

Complete Electrolytic Caustic Soda Plants.

### ENGINEERING SERVICE

We maintain an engineering organization which is prepared to furnish designs and superintend the erection of electrolytic chlorine and caustic soda plants. The different types of Allen-Moore Cells, supplemented by our engineering organization, enable us to give our clients a balanced and coordinated service.

With the two types of Allen-Moore Cells, our engineers are able to advise the prospective purchaser, entirely without prejudice, as to the best type of cell for his local conditions.

### STANDARD CONCRETE BODY ALLEN-MOORE CELL

**Distinctive Features**—The Standard Concrete Body Allen-Moore Cell, with its distinctive features of ac-



FIG. 1—UNIT OF SIXTY-FOUR ALLEN-MOORE CELLS

cessibility and economy, stands alone in the field of electrolytic cells. Year in and year out commercial service has proved conclusively that the basic principles of this cell cannot be bettered. While minor features of construction have been improved and will continue to be improved, we invite the most rigorous investigation, with full confidence that such investigation will establish the superiority of the Standard Allen-Moore Cell.

**Operating Data**—This cell is built in three sizes: 300 Amperes, 600 Amperes, 1200-1500 Amperes. The illustrations show the 1200-1500 Ampere Cell.

	1200 Amperes	1500 Amperes
Voltage per Cell.....	3.8 Volts	4.2 Volts
(Voltages per cell are the average over the complete life of the graphite anode, conservatively stated as twelve months at 1500 amperes, and sixteen months at 1200 amperes.)		
Current Efficiency (Guaranteed)....	92%	92%
Voltage Efficiency.....	60.52%	54.76%
Energy Efficiency.....	55.67%	50.38%
Production in 24 hours—		
Chlorine.....	76.9 lbs	96.1 lbs
Caustic Soda.....	86.8 lbs	108.5 lbs
Salt Consumption in 24 hours.....	170 lbs	212 lbs
Kilowatt Hours per Pound of		
Chlorine.....	1.43 K.W.H.	1.57 K.W.H.

### Dimensions and Weight—

Length, 11 ft. 2 in.; Width, 1 ft. 10 in.; Height, 4 ft. 6 7/8 in.

Approximate weight of cell set up ready for operation, 2,700 lbs.

### Mechanical Features—

The mechanical features of the Standard Allen-Moore Cell, which make for economy and ease of operation, are shown in the accompanying illustrations. Fig. No. 1 shows a unit of sixty-four Allen-Moore Cells. Attention is called to the space between cells, which permits the cell attendant to work unhampered about any part of the cell. Fig. No. 2 shows a single cell with sides closed. Note the simple construction of clamping bars and thorough-bolts, which insures a liquor-tight joint between cathode boxes and concrete body. Fig. No. 3 illustrates the drop side feature of the cell, and shows also the anode construction. For simplicity of design it would be difficult to improve the drop side feature of this cell. Changing diaphragms or repairing anodes on this cell is a matter of minutes, where other types require hours. The construction of the anode is such that a thorough circulation of electrolyte is secured.

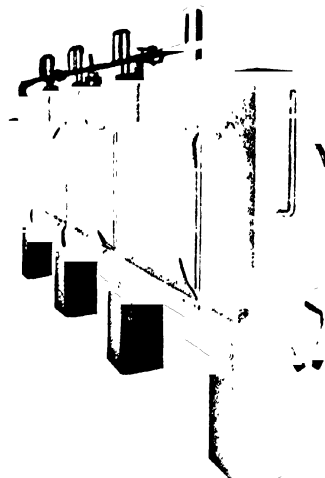


FIG. 2—SINGLE CELL

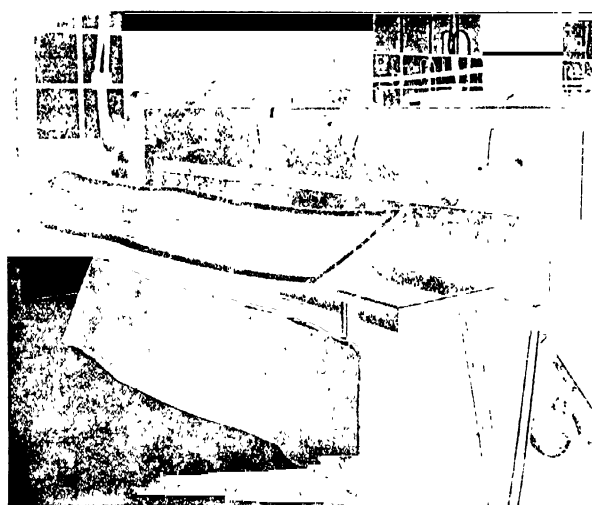


FIG. 3—ILLUSTRATING DROP SIDE FEATURE OF ALLEN-MOORE CELL

Continued on Next Page

### TYPE K ALLEN-MOORE CELL

**Adaptability**—When space or first cost is a factor, or for shipment to remote places, we offer our Type K Allen-Moore Cell, which can be shipped complete ready for assembly. The Type K Cell is made in three sizes—1000 ampere, 1500 ampere, and 2000 ampere capacities. This range of sizes not only enables us to supply the one most economical for the capacity desired, but enables the purchaser to choose a size which will conform to electrical equipment which may be available. This latter fact is particularly of importance in these times when delays in securing electrical equipment are so great.

**Operating Data**—Operating characteristics are the same as with the Standard Concrete Body Type shown on preceding page.

Dimensions and Weight—	1000 Amperes	1500 Amperes	2000 Amperes
Length	5 ft 5½ in	5 ft 6½ in	8 ft 1 in
Width	13 in	14 in	14 in
Height	38½ in	44½ in	44½ in
Approximate weight of cell set up ready for operation	1000 lbs	1200 lbs	1600 lbs

**Mechanical Features**—The magnified sections show two of the principal features of the Type K Cell. Illustration No. 7 shows the method of clamping the concrete free-board to the cathode basket, forming a gas- and liquor-tight joint without the use of cement. This

feature prevents the possibility of any leakage from the electrolyte chamber into the caustic compartment with its consequent destruction of cathode and deterioration of caustic. Illustration No. 5 shows a cross-section of the basket-shaped cathode, both sides, both ends and the bottom of which are perforated and active. We believe this feature is responsible primarily for the high efficiency and the freedom from cathode hypochlorites which characterize the cell. Furthermore, this basket-shaped cathode permits a maximum of production per square foot of floor space.

The anode follows the standard Allen-Moore design, which insures perfect circulation of the electrolyte.

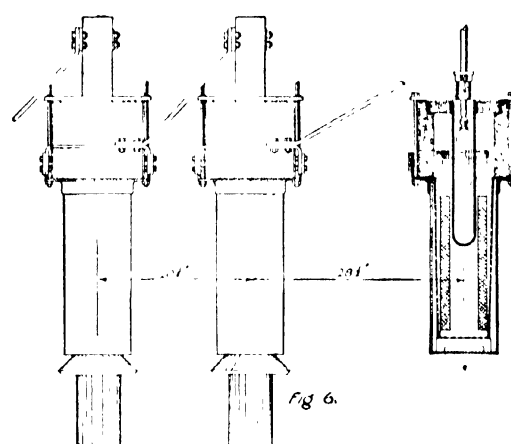


Fig. 5  
Ends, Bottom and Sides  
Are Active Cathode  
Surface

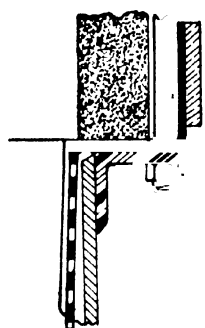


Fig. 7  
Pressure Joint Preventing  
Leakage of Electrolyte

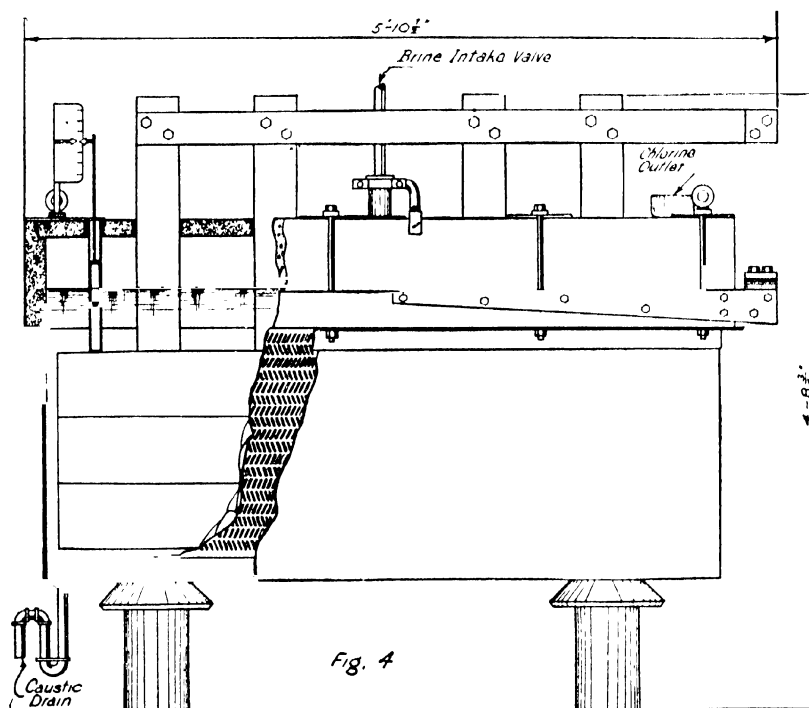


Fig. 4  
DETAILS OF CONSTRUCTION TYPE K ALLEN-MOORE CELL

# G. H. ELMORE

Colonial Trust Building

PHILADELPHIA, PA.

## PRODUCTS

### Continuous Centrifugals.

#### THE ELMORE CONTINUOUS CENTRIFUGAL

Less power—no stopping and starting

Less floor space—because of greater capacity

Less labor—no more than to operate a motor

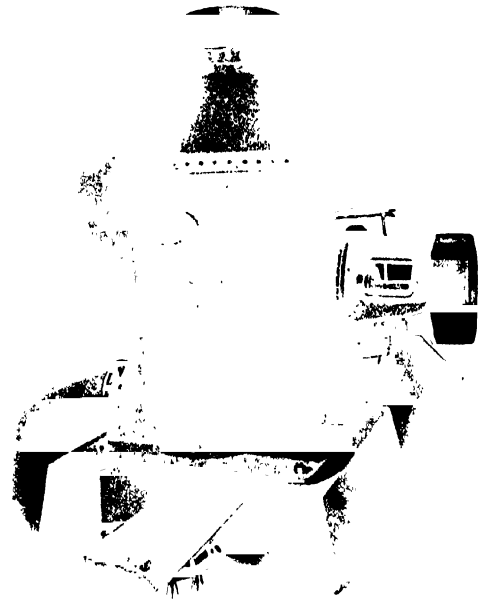
Greater capacity—frequently five to ten times greater than basket centrifugals of the same diameter

The above are the results of continuous operation and are outstanding features of the Elmore Centrifugal. The principle of operation is described fully in the 1920 edition of the Chemical Engineering Catalog

The design permits the use of various metals in construction; screens of different materials and sizes, and baskets of various shapes, all of which assist materially in the solution of difficult problems.

The machines are supplied in four sizes (10, 24, 36 and 48") with capacities ranging from 200 to 3500 cu. ft. per hour.

Fifteen of the 48" machines have been sold for drying coal preparatory to charging to coke ovens. Others of the 10", 24" and 36" machines are in service on apple pumace, maltose meal, phosphate rock, tanning extracts, naphthalene, alkali, ammonium carbonate, boracic acid, and various other chemical products.



ELMORE CONTINUOUS CENTRIFUGAL

The most fundamental applications are in the fields now held by filter presses, vacuum filters and the batch type centrifugals.

All centrifugal and filtration processes at present in use, suffer from one common disadvantage. When the filter begins to work, it also begins to choke. This is not true of the **Elmore Continuous Centrifugal**.

Please give us details of your problem and we will be glad to send you a bulletin and full information.

CAPACITY, HORSEPOWER REQUIREMENTS AND OTHER DATA FOR ELMORE CONTINUOUS CENTRIFUGALS

Type	Inside diam. of conical screen frame at bottom	Maximum capacity in cu. ft. per hour	Maximum H. P. required	R. P. M. countershaft	Size of driving pulleys	R. P. M. center spindle shaft	Net weight	Weight boxed for export	Cu. ft. cargo space	Floor space	Code word
B	48"	3500	35	200-450	30 x 10	307-893	16000	17300	800	7'-0" x 7'-6"	Ermore
B	36"	1500	20	250-900	24 x 6	905-1452	10250	12000	275	6'-0" x 6'-6"	Lemore
B	24"	800	15	300-700	20 x 6	900-2100	6700	7400	160	5'-0" x 5'-6"	Melroe
B	10"	200	8	500-900	14 x 4	1500-3000	1000	1200	85	3'-0" x 3'-0"	Moerel



# THE ELWELL-PARKER ELECTRIC CO.

"Pioneer Builder of Electric Industrial Trucks"

4400 St. Clair Avenue, CLEVELAND, OHIO, U.S.A.

OFFICES IN PRINCIPAL CITIES

## PRODUCTS

**ELECTRIC STORAGE BATTERY INDUSTRIAL TRUCKS** of the Tractor, Elevating Platform or "Self-Loading," Carrier, End Dump, Revolving Crane, Straight and Drop Frame Types. For rail or floor.

## APPLICATIONS

Used inside buildings; in yards or across streets; on inclines, elevators, bridges, or through tunnels at steel, tin plate, paper, cotton, textile and lumber mills, clay working, salt, sugar, chemical, automobile, fertilizer, leather, rubber, glass and power plants, foundries, machine shops, factories, hospitals, shipyards, warehouses, piers, railroad and marine passenger and freight terminals for quick, economical inter-department transfer of materials. It matters little what the commodities are, electric trucks can be used to handle them at less expense—first cost, maintenance and adaptability to present manufacturing conditions considered.

## OPERATION AND ORIGINAL FEATURES

Elwell-Parker trucks and tractors steer on all four wheels, and are two or four wheel drive. Edison or Lead battery furnishes power to totally enclosed drum type controller and motor. Motor drives through single reduction free coasting worm gear to large diameter solid rubber tired wheels. Battery assembled in a box, may be charged in the truck or removed and charged,

or exchanged for one already charged. Battery capacity sufficient for 15 to 20 miles operation, or the average day's work in a factory. Charge from DC or AC line in 7 hours at 40 volts and 40 to 60 amperes.

Patent interlocked control is so arranged that truck or tractor cannot be started except when operator is standing on pedals or sitting in seat. This control makes a fuse unnecessary. Motor will take entire battery charge. Power may be applied with brakes partially set—important when starting on inclines. When operator steps from truck same will stop within its length.

Speeds 400 to 700 feet per minute. Carrying capacity of trucks 4000 lbs. Draw bar pull of tractors 6 to 30 tons. Self-loading trucks will pick up 4000 lbs. in 10 seconds. Cranes lift 1000 lbs. at 28' over side of truck. Dump trucks with 36 cubic foot end dump, and 40 cubic foot side dump bodies. Platform heights range from 11 to 33 inches; platform lengths from 4 to 11 feet; platform widths  $2\frac{1}{2}$  to  $3\frac{1}{2}$  feet.

## INQUIRIES

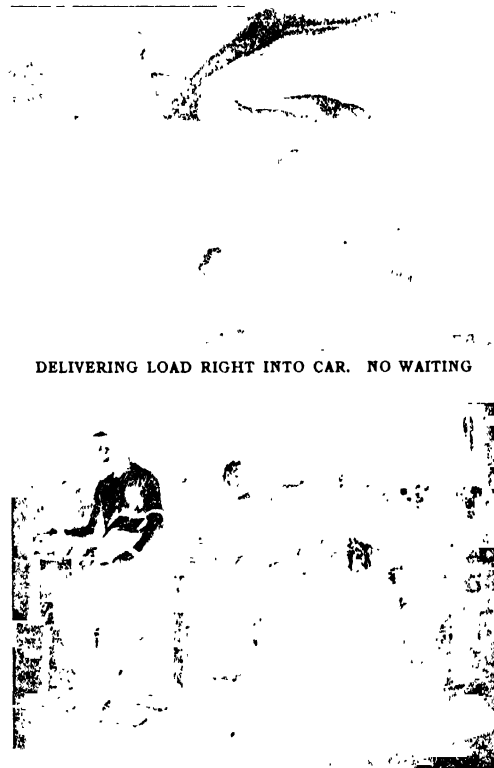
When making inquiry, state size and weight of material, amount to be moved per hour or day, length of haul, percentage and length of grade or inclines, and size and capacity of elevators. Give width of passages at shortest turn. State electric current characteristics. Complete catalog on request.



DUMP TRUCK RECEIVING LOAD OF FERTILIZER FROM CONVEYOR



TEN TONS OF NITRATE PER TRIP. 275 TONS 1800 FT. IN 7 HOURS



DELIVERING LOAD RIGHT INTO CAR. NO WAITING

EIGHT CARBOYS OF ACID AT A SINGLE LOAD

# THE ELYRIA ENAMELED PRODUCTS COMPANY



New York  
101 Park Ave

ELYRIA, OHIO

Pittsburgh  
Oliver Bldg

Chicago  
Conway Bldg

San Francisco  
310 Sansome St



CANADIAN REPRESENTATIVES  
Canadian Milk Products, Ltd., Toronto, Ont., Canada

## PRODUCTS

Glass Enameled Apparatus.

Glass-lined cast iron chemical equipment.

Still; Evaporating dishes; Vacuum pans; Autoclaves; Condensers; Boiling kettles; etc.

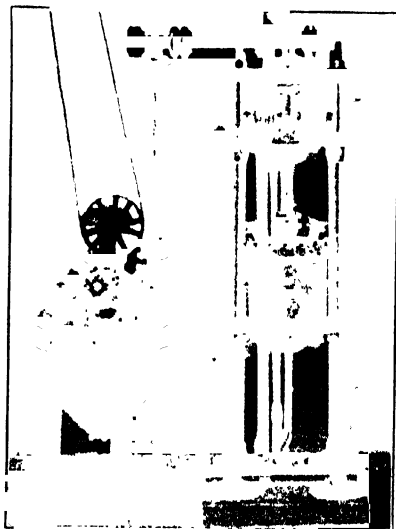
Glass enameled steel equipment for storage, mixing, pasteurizing, boiling, and concentrating purposes in the chemical, pharmaceutical, dairy, canning, packing, beverage, food and other industries.

Steel tanks or cast iron equipment not enameled.

Capacities range from 2 gallons to 7000 gallons.

## ACID RESISTANT ENAMEL

Elyria glass enamel has all the acid resisting properties of chemical glass. It contains no metallic oxides. It is fused at high temperatures, making it tough and durable. Elyria enamel has been perfected to give long, continuous service.



ENAMELED CAST IRON STILL, CONDENSER AND RECEIVER  
CAPACITIES 2 GAL. TO 250 GAL.

## GLASS ENAMELED CAST IRON EQUIPMENT

A standard line of equipment is available, including units for all the usual chemical processes. Elyria glass lined cast iron equipment gives excellent service under most types of acid or other chemical conditions; using pressure or vacuum, steam jacket or the higher oil jacket temperatures.

## GLASS ENAMELED STEEL EQUIPMENT

Elyria glass enameled steel equipment is seamless one-piece apparatus. It is suitable for the storage, boiling, mixing or concentrating of many chemical and pharmaceutical products. It has found a wide application in the processing of industrial food products such as oil refining, canning, fruit juice concentration, gelatine storage, dairy products, etc. It is ideal



ENAMEL LINED PHARMACEUTICAL STORAGE AND MIXING TANKS

equipment where sanitation and freedom from impurities are desired.

## EQUIPMENT NOT ENAMELED

Our high grade seamless welded steel tanks and chemical castings are available for processes not requiring enameled equipment.



ENAMELED CAST IRON TILTING KETTLE HEATED BY AN OIL JACKET

## RESEARCH LABORATORY

Our laboratory includes a ceramic department devoted to the maintaining of the high standard of our glass enamels.

The chemical engineering department is equipped with small working units, both enameled cast iron and steel, for working out new processes or for testing out the applicability of our equipment to the customer's process. Consultation is confidential and the service is entirely free.

## CATALOGS

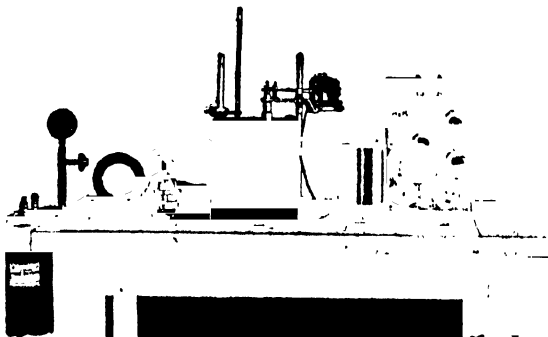
Write to the nearest office for recent literature concerning the uses of our equipment.

# EMERSON APPARATUS COMPANY

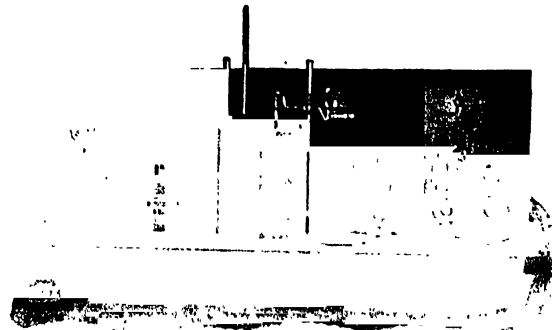
171 Tremont St.  
MELROSE, MASS.

## PRODUCTS

Industrial Laboratory Apparatus; including: Emerson Calorimeters; Emerson Textile Conditioning Ovens; Rubber Buffing Machines and Viscosimeters.



EMERSON FUEL CALORIMETER  
WITH SINGLE VALVE BOMB

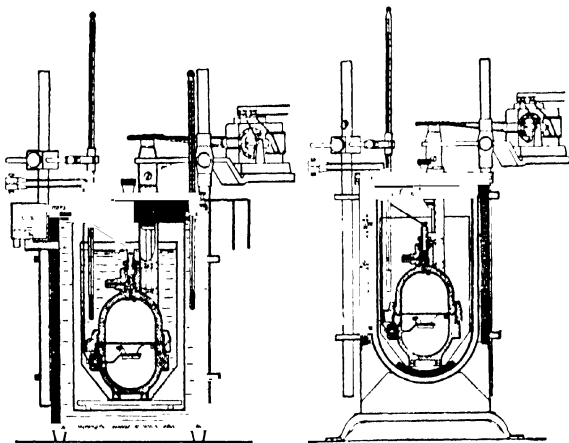


EMERSON CALORIMETER  
WITH DOUBLE VALVE BOMB

Both types of Calorimeter can be supplied with Daniels' Adiabatic Jacket.  
Only single valve calorimeter can be supplied with Vacuum Walled Jacket.

## CONDITIONING OVENS

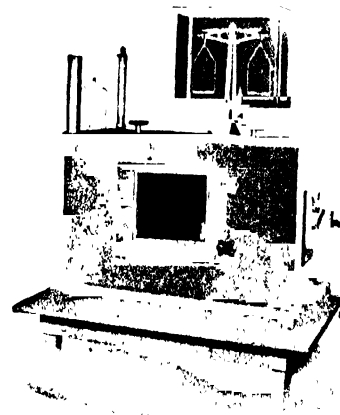
For the determination of moisture in textile products.



VACUUM WALLED  
ADIABATIC JACKET

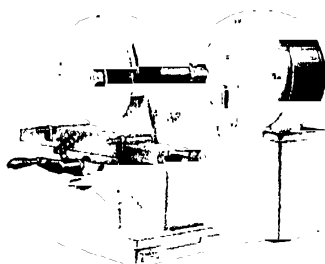
DANIELS'  
ADIABATIC JACKET

For Emerson Calorimeters



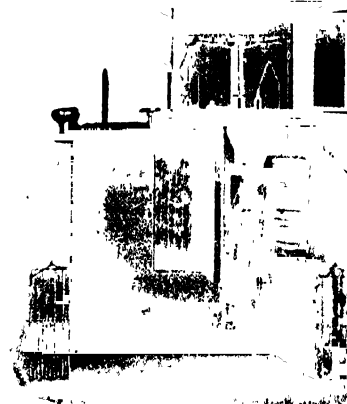
EMERSON EIGHT-BASKET CONDITIONING OVEN

Baskets 3" x 3" x 6" deep. Power required, 1000 watts.  
Used for testing small samples of textile materials weighing not more than four or five ounces.



RUBBER BUFFING MACHINE

This machine grinds rubber samples, for tensile strength test, to an absolutely uniform thickness.



EMERSON FOUR-BASKET CONDITIONING OVEN

Baskets, 7" x 7" x 18" deep. Power required, 2000 watts.  
For testing bulky samples of textiles weighing from  $\frac{1}{4}$  lb. up to 1 lb.

# ESTERLINE AND ANGUS

Engineers and Managers  
INDIANAPOLIS, IND.

## THE ESTERLINE-ANGUS COMPANY

Manufacturers of Electrical Instruments  
1547 LEMCKE ANNEX, INDIANAPOLIS, IND.

## THE REPEL-ARC FURNACE COMPANY

Manufacturers of Electric Arc Furnaces  
227 E. SOUTH ST., INDIANAPOLIS, IND.

### PRODUCTS

Made by The Esterline-Angus Company:

Graphic Recording Instruments, Concentration Meters, Portable Current Transformers, Shunts, Maximum Demand Meters.

### TYPES

Graphic Ammeters for A. C. and D. C. circuits  
Graphic Voltmeters for A. C. and D. C. circuits  
Graphic Wattmeters for A. C. and D. C. circuits  
Graphic K. V. A. meters for A. C. circuits  
Graphic Power Factor Meters.  
Graphic Speed Recorders.  
Graphic Production Recorders.  
Graphic Concentration Recorders.  
Graphic Ohm-Meters  
Portable current transformers.  
Portable concentration indicators.  
Portable and switchboard shunts.

### USES

For making continuous records of any electrical quantity; testing motor loads, operations of equipment; checking power bills; recording production; recording the resistance or concentration of solutions.

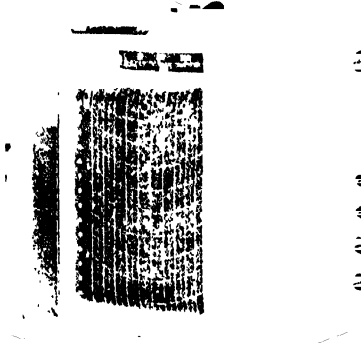
### ADVANTAGES

Can be furnished in wall, switchboard and portable types; chart speed from  $\frac{3}{4}$  to 360 inches per hour; operate one week without attention; stationary ink supply; removable writing mechanism; direct acting, no relays or contacts.

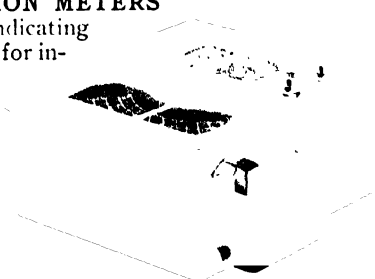
### CONCENTRATION METERS

Made in both indicating and graphic types for indicating for recording the concentration of solutions and density of electrolytes; regulating blowing down of boilers and detecting leakage in surface condensers using salt water for cooling.

Complete catalog on request to The Esterline-Angus Co. Sales offices in all principal cities.



ESTERLINE-ANGUS GRAPHIC RECORDING INSTRUMENT



PORTABLE METER

### PRODUCTS

Made by The Repel-Arc Furnace Company:

Electric Arc Furnaces for melting and Refining Ferrous and Non-Ferrous metals.

### SIZES

Furnaces of this type are made in four sizes:  $\frac{1}{8}$  ton,  $\frac{1}{4}$  ton,  $\frac{1}{2}$  ton, and 1 ton.

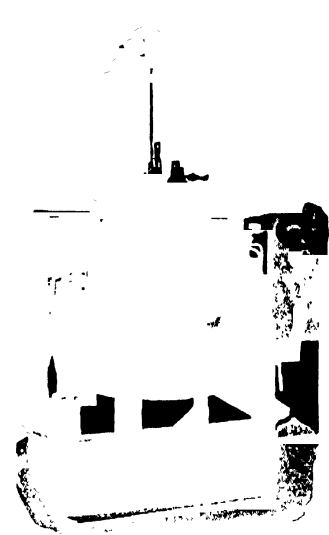
### SERVICE

For melting and refining all kinds of ferrous and non-ferrous metals; melting alloys, experimental work.

### CHARACTERISTICS

This furnace is automatically self-regulating, requiring no special transformers or regulating auxiliaries. It is made for three phase A. C. and D. C. circuits; Power factor on A. C. circuits 70 to 80. Load is steady and balanced; furnace can be connected to any 220-volt motor circuit.

It is a combined direct-arc and indirect-arc furnace; on account of the self-regulating feature, the arc can be maintained either between the carbons or between the carbons and the molten bath.



REPEL-ARC FURNACE

### ADVANTAGES

Three phase; balanced; high power factor, steady operation; simple; no regulating equipment, no special transformers; will melt both ferrous and non-ferrous metals. Charging is done through the roof; very efficient in operation; requires minimum attention.

Complete catalog on request to The Repel-Arc Furnace Co.

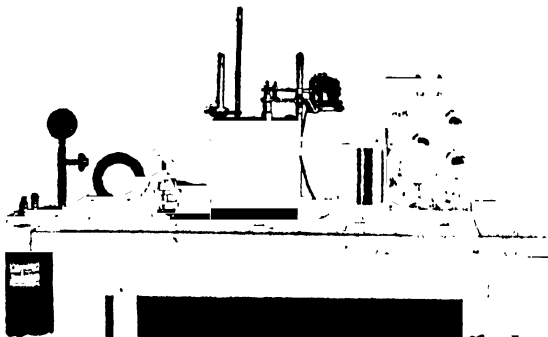
Sales offices in all principal cities.

# EMERSON APPARATUS COMPANY

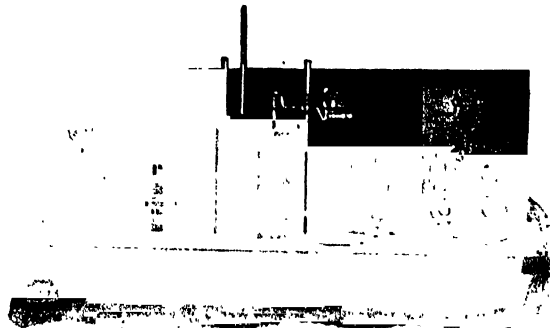
171 Tremont St.  
MELROSE, MASS.

## PRODUCTS

Industrial Laboratory Apparatus; including: Emerson Calorimeters; Emerson Textile Conditioning Ovens; Rubber Buffing Machines and Viscosimeters.



EMERSON FUEL CALORIMETER  
WITH SINGLE VALVE BOMB

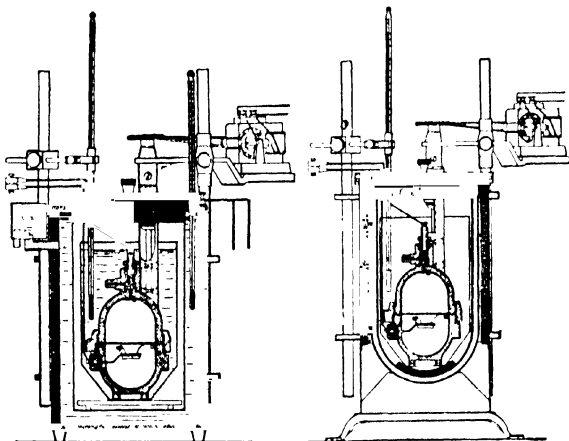


EMERSON CALORIMETER  
WITH DOUBLE VALVE BOMB

Both types of Calorimeter can be supplied with Daniels' Adiabatic Jacket.  
Only single valve calorimeter can be supplied with Vacuum Walled Jacket.

## CONDITIONING OVENS

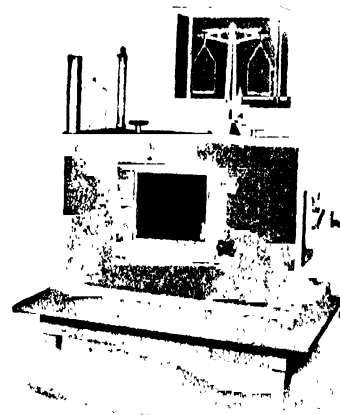
For the determination of moisture in textile products.



VACUUM WALLED  
ADIABATIC JACKET

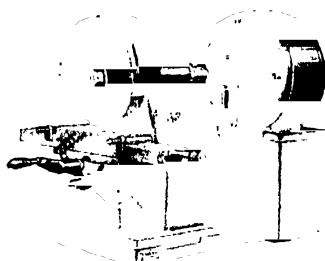
DANIELS'  
ADIABATIC JACKET

For Emerson Calorimeters



EMERSON EIGHT-BASKET CONDITIONING OVEN

Baskets 3" x 3" x 6" deep. Power required, 1000 watts.  
Used for testing small samples of textile materials weighing not more than four or five ounces.



RUBBER BUFFING MACHINE

This machine grinds rubber samples, for tensile strength test, to an absolutely uniform thickness.



EMERSON FOUR-BASKET CONDITIONING OVEN

Baskets, 7" x 7" x 18" deep. Power required, 2000 watts.  
For testing bulky samples of textiles weighing from  $\frac{1}{4}$  lb. up to 1 lb.

# ESTEY WIRE WORKS COMPANY

Manufacturers of Wire Products

34 Cliff Street

NEW YORK, N. Y.

## PRODUCTS

**Flexible Conveyor and Transmission Wire Belting.**  
**Wire Cloth, of steel, brass, copper, monel or other metals for all purposes.**  
**Screening apparatus.**  
**Wire products.**

## FLEXIBLE BELTING

We specialize in flexible belting for various purposes and would be pleased to have conveying problems submitted to us for solution

The advantages of flexible belting are as follows:

It possesses sufficient strength to act as a drive belt as well as a conveying belt

It may be made in any width without a break.

It can be made in any length without lacing or other joint.

A piece of any size may be taken out or inserted at any point without in any way affecting the character of the belt.

It can be made in any mesh, from the fineness of a lady's mesh bag to as coarse as may be desired.

It may be made from any size wire from the finest up to  $\frac{3}{8}$ " rod if required

It may be made of any kind of metal necessary to resist the action of various materials

It may be used on any size of pulley as its flexibility conforms to the surface and still gives sufficient traction

It is very much cheaper than any other belt of similar utility.

It may be used for drums containing pins or other irregularities.

Its openings permit the free passage of steam, hot air, water or other substances, which are necessary in some classes of manufacture

Repairs can be made at trifling cost by inexperienced workmen. As this consists simply of replacing defective wires with new wires, the belt is made exactly like new. These repair wires can be kept on hand at slight expense.

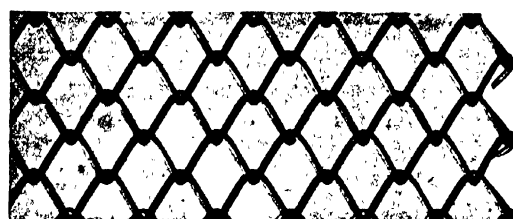
Promptness of delivery could be assured as the same machine could make a wide variety of meshes

The tendency to crawl sidewise, which was formerly caused by the spiral construction of the belt, has been perfectly overcome by a system of reverse twist which keeps the belt perfectly in line without the use of pins or flanges.

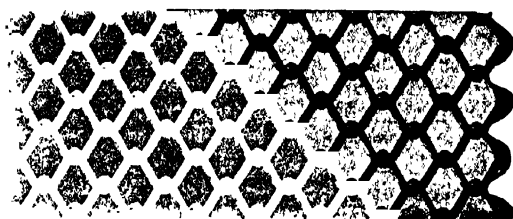
May be used for conveying and screening simultaneously.

We illustrate a few of the innumerable types of belting which we manufacture.

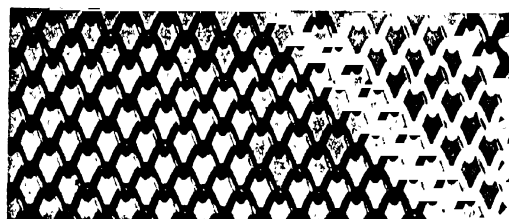
Detailed information will be sent upon request.



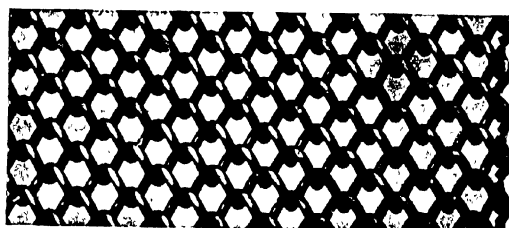
No. 418



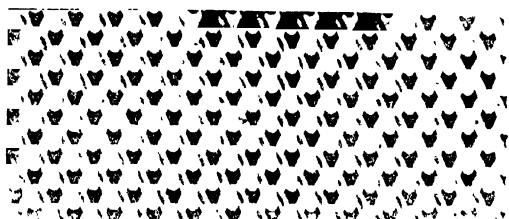
No. 418



No. 618



No. 516



No. 616

FULL SIZE ILLUSTRATIONS FLEXIBLE WIRE BELTING

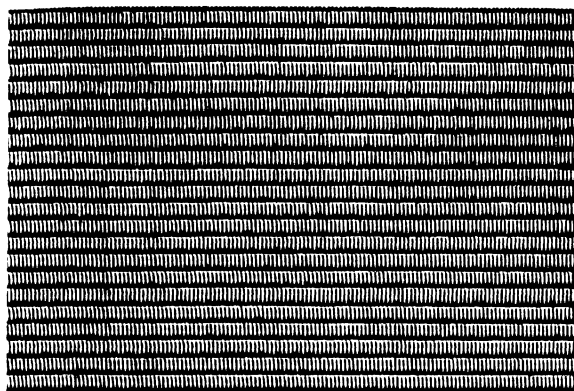
NOTE: The coarsest mesh shown above is three openings to the inch. We can furnish any larger mesh, however, up to six-inch opening and any gauge wire required.

*Continued on Next Page*

**DUTCH WIRE CLOTH**

Is made from Steel, Brass, Tinned Brass, Monel Metal or Copper Wire, and in various meshes. It is used extensively for filtering purposes in sugar refineries, and the fermentation industries. It is made both plain and twilled.

This cloth is usually made specially to order, but we carry in stock 10 x 80 mesh and 14 x 120 mesh.



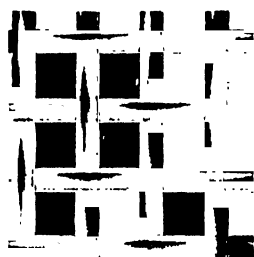
**DUTCH WIRE CLOTH**  
10 x 80 Mesh

**ESTEY DOUBLE-CRIMPED MINING WIRE CLOTH**

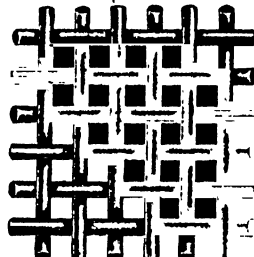
This cloth is made of special wire adapted for the heaviest work in Battery Screens, Jigs, etc. It is made of Brass, Copper or Phosphor Bronze.

Where the screen comes in contact with acid, Phosphor Bronze Cloth will wear longer than any other material.

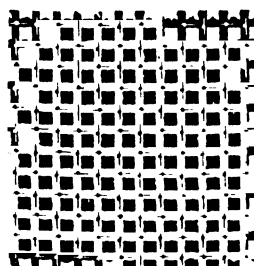
Our cloth is recommended for its uniform mesh and owing to the fact that the wires are crimped both ways, presenting a smooth surface, it has no equal for use in stamp Batteries and Jig Screens.



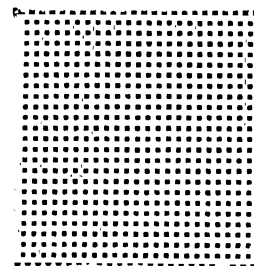
2 1/2 x 2 1/2 No. 10 Steel.



4 1/2 x 4 1/2 No. 13 Steel.



8 Mesh No. 18 Steel



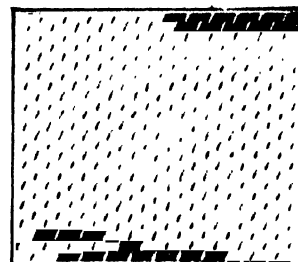
16 x 16 No. 22 Steel.

**TYPES OF OUR WIRE CLOTH**

**FLEXIBLE SPIRAL CLOTH**

Flexible spiral cloth in brass or other metal is especially adapted for use with sugar centrifugals, etc. It can be furnished in any mesh or size of wire, and in whatever dimension may be required. Prices on application.

Brass or iron backing wires will be furnished in any desired width and length. Seven and eight mesh are standard.



**CENTRIFUGAL CLOTH**

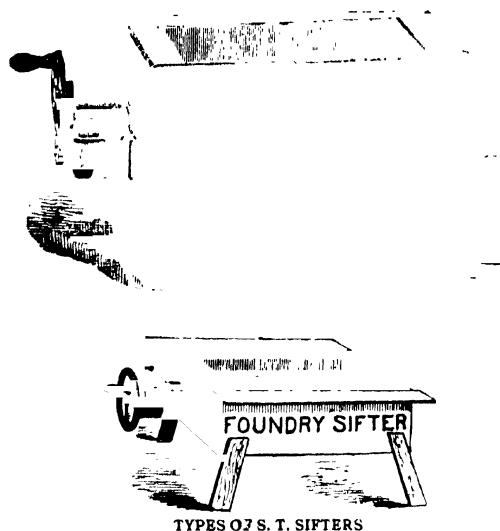
**WOOD FRAME SIEVES**

Chemists' sieves of all diameters made of brass, copper, steel or other material in all meshes. We furnish them with tin, brass or wood frames as desired.

**S. T. SIFTING MACHINES**

These machines are made to be operated either by hand or power. They are used wherever material to be sampled and tested must be screened first to uniform size.

We also carry complete laboratory sets of standard testing sieves.



**TYPES OF S. T. SIFTERS**

**STOCK**

We carry in stock for immediate shipment steel, copper, copper coated, brass, phosphor bronze, galvanized and tinned wire cloth suitable for any industrial requirement.

# EYNON-EVANS CORPORATION

Power Specialties—Brass Castings

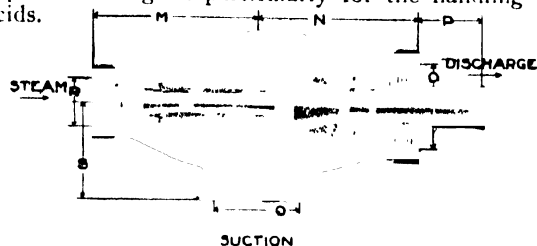
FIFTEENTH AND CLEARFIELD STREETS, PHILADELPHIA, PA.

## PRODUCTS

Syphons, Blowers, Compressors and Exhausters, Injectors, Noiseless Water Heaters, Woodlined Valves, Locomotive Gauge Cocks, Acid Resisting Bronze Valves.

## SYPHONS

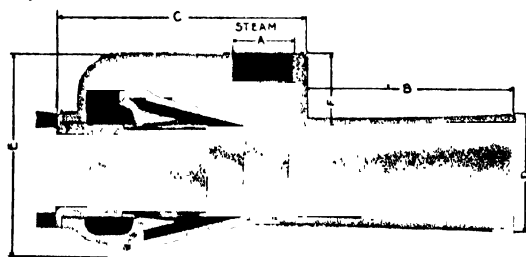
Through twenty-five years of experience in the manufacture and sale of Syphons we have developed a complete line with representative types to meet any requirement of service and each with the proper balance between efficiency and durability. Syphons can be furnished in any size, of brass or iron, with or without couplings or for flanged connection. A lead-lined syphon is designed particularly for the handling of acids.



EYNON-EVANS SYPHON

## NOISELESS HEATER

Wherever liquid is heated by direct mixture with steam, our Noiseless Heater offers a most efficient and desirable method of introducing the steam and as the steam discharges through the heater it causes the liquid to circulate with the steam. This action takes up all the steam, circulates the liquid and does it noiselessly.



NOISELESS HEATER

## COMPRESSOR AND EXHAUSTER

The Compressor and Exhauster uses a steam jet of high velocity to entrain vapors, gases or air and discharge the mixture. It will draw from a vacuum and discharge against pressure. It is a most satisfactory

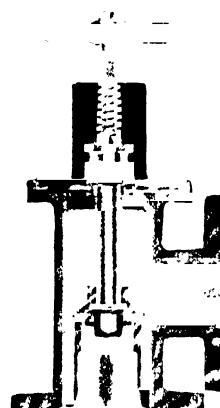


COMPRESSOR AND EXHAUSTER

device to prime centrifugal pumps by exhausting the air from case and suction. As a Vacuum pump it is applied to filters, evaporators and stills. As a compressor, it is used for agitation of liquids by discharging compressed air through the liquid.

## EYNON-EVANS WOOD-LINED VALVE

Our Woodlined Valve is designed for service where acidity quickly destroys iron or brass valves. It is built of iron and lined with wood in such a manner that the action of acid on the body of the valve is practically eliminated. The seat and disc are of easily renewable construction.



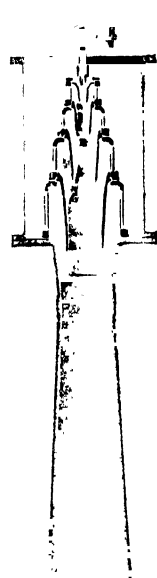
WOODLINED VALVE

## EYNON-EVANS JET BLOWER

The Eynon-Evans Jet Blower is best known for its universal application to Gas Producers.

Its correctly designed multiple nozzles make a blower of high efficiency. Adjustment of the steam jet and the blast gate permits of a mixture of air and steam in proper proportions to give the blast desired.

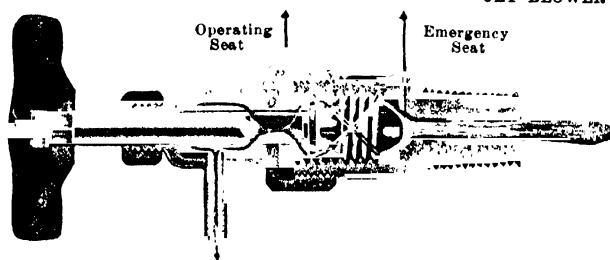
The high efficiency of this blower, together with its extreme simplicity, has brought it into extensive use for forced draft purposes under boilers and furnaces of all descriptions. It is often operated with Compressed air instead of steam where such arrangement has advantages.



EYNON-EVANS JET BLOWER

## LOCOMOTIVE GAUGE COCKS

The Locomotive Gauge Cock which for years has been a Railroad standard. Its application to industrial locomotives is extensive. The operating seat may be renewed with cock under pressure—accomplished by closing the emergency seat and removing the bonnet.



LOCOMOTIVE GAUGE COCK



# FAIRBANKS, MORSE & CO.

Electric Motors, Oil Engines, Pumps

CHICAGO, ILLINOIS

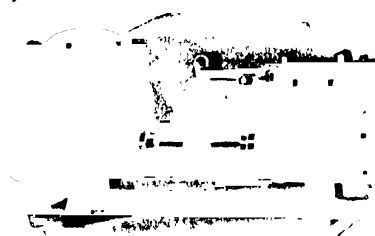


## PRODUCTS

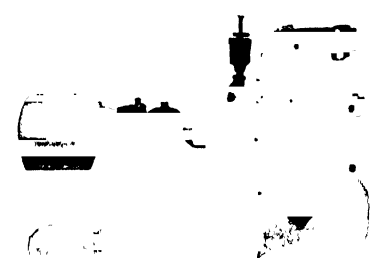
Electric Motors; Dynamos; Alternators; Lighting Plants; Starters; etc.; Pumps—Centrifugal, Steam, Power, for every service; Oil Engines, 10 h. p. to 300 h. p.; Marine Oil Engines, 30 h. p. to 300 h. p.; Kerosene Engines, 1½ h. p. to 20 h. p.; Scales, all kinds; Railway Supplies; Motor Cars; Standpipes; Coaling Stations; etc.; Water Systems; Tanks and Towers; Hoists; Air Compressors; etc.

## PUMPS

Fairbanks-Morse pumps are made to accommodate practically every pumping need, each type embodying the long experience and familiarity of competent engineers. The application of pumping machinery to the widely varied needs of the chemical industry re-



**BOILER FEED AND GENERAL SERVICE PUMP**  
Sizes 4½ x 3 x 4 ft to 6 x 4 x 6 ft



**FIG. 505. BELT DRIVEN CENTRIFUGAL PUMP**

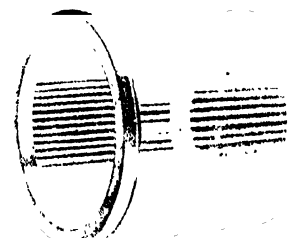


**FIG. 1003. 5-INCH, 3-STAGE HORIZONTALLY SPLIT CASING CENTRIFUGAL PUMP DIRECT CONNECTED TO 75 H.P. FAIRBANKS-MORSE INDUCTION MOTOR**

quires such a diversity of types and sizes that we are only attempting to illustrate a few of the various types adaptable to the uses for which pumps are used in the many branches of this industry.

## MOTORS

**Solid Metal Rotor Winding**—The rotor winding (over 3 h. p.) is solid metal without joints. There is no solder. No screws or rivets. Nothing to loosen up, spark, flash or burn and impair the motor's power and efficiency. The end rings are cast on solid copper bars in such a way that the metal of the bars and the metal of the rings are fused together in one solid jointless structure. Mechanically and electrically strong.



**THE ORIGINAL JOINTLESS ROTOR CAGE**

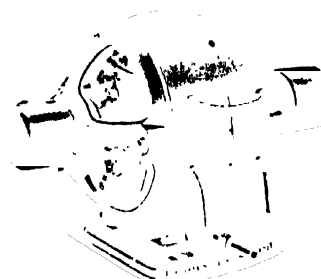
All one piece—no joints

**"H" Squirrel Cage Ball Bearing**—For alternating current. Ball bearings mean less friction, higher efficiency, proved reliability. "H" motors have grease lubrication, bearings are dustproof; no oil slop. Bulletin 210-B.



**"H" SQUIRREL CAGE BALL BEARING MOTOR**

**"CP" Ring Oiling Sleeve Bearing**—For direct current. Commutating pole or interpole type. Either constant speed or adjustable speed for machine tools. Bulletin 27.



**"CP" RING OILING SLEEVE BEARING MOTOR**

**"KBV" Internal Starter**—For alternating current. Especially adapted for remote control. Close a switch to start, open it to stop. Switch may be located anywhere. Takes little starting current. May be used where squirrel cage motors would impair the lighting service. Bulletin 210.



**"KBV" INTERNAL STARTER MOTOR**

# ANDREW M. FAIRLIE

Consulting Chemical Engineer

Citizens & Southern Bank Building

ATLANTA, GA.

Cable Address  
"FAIRLIE" Atlanta

P. O. Box 358

Long Distance Telephone  
IVY 7058

## SERVICES

### Design of Chemical Plants

I am a specialist in the design, construction and management of sulphuric acid plants.

I give my personal attention to the work of my clients.

I design and supervise the construction and equipment of complete plants, with any desired type of chamber, for the manufacture of sulphuric acid from brimstone, or pyrites, or from the gases of zinc ore or copper ore roasters, or from the waste gases of copper blast furnaces, or copper converters.

I design acid- and weather-proof chemical towers, either all-masonry or lead-lined, as desired.

Plants are designed with a view to durability, low maintenance cost, and economical operation. Many years of operating experience have taught me what kinds of materials and equipment details to use.

## ADVISORY ENGINEERING SERVICE

For concerns having their own engineering staff, or desiring to incorporate to some extent their own ideas in a new plant, I render an advisory consulting service.

## REMODELING SERVICE

I remodel plants which are operating inefficiently, and remodel or rebuild old or worn-out plants.

## DIAGNOSIS SERVICE

I diagnose the diseases of "sick" acid plants, and apply the appropriate remedies.

## ANALYTICAL CONTROL OF THE CHAMBER PROCESS

I offer my patented method of operating the chamber process for making sulphuric acid, introduce same where desired, and train the plant operatives in its use.

## MANAGEMENT AND MAINTENANCE SERVICE

I offer a management and maintenance service, supervising operations and upkeep of plant, which can be arranged for by the year.

Some of the largest acid producers in the world find it profitable to retain my services, on an annual basis, year after year.

I have effected economies at operating plants, which have reimbursed my clients many times the cost of my services. References furnished on request.

## MILLS-PACKARD CHAMBERS

I am the sole agent for the United States for the Mills-Packard patented water-cooled sulphuric acid chamber. (See page 748.)

## DESIGNS FURNISHED FOR:

Acid- and weather-proof towers

Acid chambers

Acid distributing devices

Acid plants, complete

Gas fans and dampers

Gay-Lussac towers

Glover acid coolers

Glover towers

Inter-chamber acid coolers

Inter-chamber towers

Nitrating equipment for acid plants

Packing material for chemical towers

Sulphuric acid plants, complete, any desired type of chamber system

Tanks

All sulphuric acid plant details.

# FAWCUS MACHINE COMPANY

Manufacturers of Cut Gears and Special Machinery

2818 Smallman Street

PITTSBURGH, PA.

Co-Manufacturers

**DOMINION STEEL PRODUCTS CO.**

BRANTFORD, ONT., CANADA

AGENTS

K. W. Eichelberger, San Francisco, Calif.

Catlin Calder Co., Boston, Mass.

Manufacturers Selling Agency, Birmingham, Ala.

W. G. Phillips, Calumet, Mich.

L. E. Meidinger, Milwaukee, Wis.

## PRODUCTS

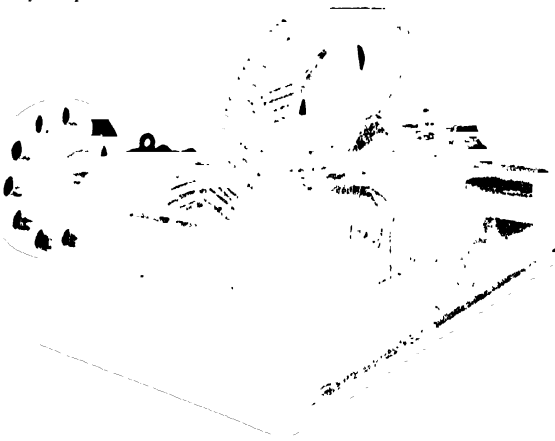
Fawcus Herringbone Cut Gears.  
Fawcus Herringbone Gear Drives.  
Fawcus Herringbone Turbine Transmission.  
Fawcus Flexible Couplings.  
Spurs, Bevels, Worms, Worm Wheels.  
Worm Reductions.

**FAWCUS**

Trade Mark

## SERVICES

Our engineers, at all times, will gladly advise, recommend and furnish estimates on gear and machinery requirements.



FAWCUS HERRINGBONE GEAR DRIVE

## FAWCUS HERRINGBONE GEAR DRIVES

These drives are built in eight standard sizes from 75 horsepower to 1500 horsepower, ratios up to 12 to 1. Special designs up to and including 15,000 horsepower with flywheels if necessary. Double reduction ratios 50 to 1.

## HIGH SPEED TURBINE TRANSMISSIONS

These transmissions are built in twelve standard sizes, 25 horsepower to 1200 horsepower, ratios up to 12 to 1. Turbine speeds up to 4200 R.P.M.



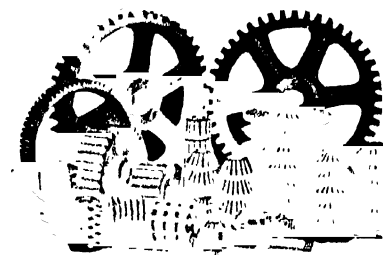
HERRINGBONE GEAR  
HIGH SPEED TRANSMISSION

## FAWCUS HERRINGBONE CUT GEARS

Herringbone gears are cut in solid blanks on Fawcus Patented Hobbing and planing machines. Opposite halves of each tooth are machined simultaneously, thereby obtaining maximum accuracy of

tooth form, spacing, and alignment. Correct construction demands that the two halves of each tooth be set opposite, the apex of the angle being in the center of the gear face. Face width must be so proportioned that teeth will have overlapping or continuous action. The minimum face width is about six times the circular pitch of the teeth for standard helix angle of 23 degrees.

All teeth are cut to diametrical pitch standards 20 degrees involute short addendum.



SPURS, BEVELS, WORMS, WORM WHEELS

Cut gears are all made of the best quality high carbon hammered forgings, cast steel, cast iron, semi-steel, brass, bronze, rawhide, fiber, and cut on up to date automatic machines assuring maximum accuracy.

## WORM REDUCTIONS

Built in six standard sizes, ratios 15 to 120 to 1. Special designs to suit customer's requirements.



WORM REDUCTION

Send for gear booklet

# DAN W. FEITEL BAG COMPANY, LTD.

Manufacturers of New and Used Burlap and Cotton Bags

NEW ORLEANS, LA.

Chicago  
348 E. Illinois St.

BRANCHES

New York  
110 Front St.

Cable Address  
"FFIBAG," New Orleans

## PRODUCTS

We handle Used and New burlap and cotton bags of all descriptions.

## FACILITIES

Our facilities are complete in every respect. Our main office and plant is located in New Orleans, where our factory covers an entire square, devoted almost entirely to the reclaiming and manufacturing of Used burlap and cotton bags, with a daily capacity of 100,000. We also have branch offices in Chicago and New York, with all necessary equipment for the quick distribution of our bags in those sections.

## CONNECTIONS

The connections we have are in the larger cities of the country, as well as in Calcutta and the principal European centers, permitting us to keep posted on local and foreign markets.

## QUALITY

As for quality our bags are known familiarly to the consuming trade as **Feitel-ized Bags**, each and every one of which is first carefully selected, inspected, neatly mended where needed, graded uniform in size and packed, thus insuring 100% service and satisfaction.

## SERVICE AND DELIVERY

Service and delivery can be given without unnecessary delay, as we maintain adequate stocks of bags at all times. We have a staff of bag experts always available to assist you in the solution of your bag problems. They know just what bags are required for

each purpose. The use of the proper bag is very essential for the promotion of efficiency and economy in the operation of any bag using plant. It is our business to advise you concerning the most appropriate bag for sacking and shipping your products, with the idea of getting the maximum service at the minimum cost.

## SPECIALIZING

As we specialize in bags for the Chemical and Allied Industries, we are well prepared to advise you concerning the bag best adapted to your needs. Below are a few of the chemical products now being packed in **Feitel-ized Bags**:

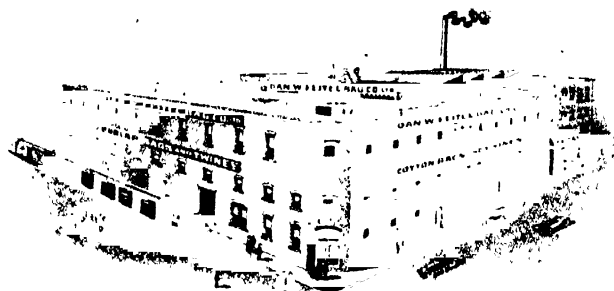
Charcoal,	Graphite,
Sulphur,	Iron Borings,
Naphthalene,	Ammonia Sulphate,
Silica,	Beaten Soda,
Acetate of Lime,	Soda Ash,
Fuller's Earth,	Cottonseed Products,
Cellulose Acetate,	Fertilizers,
Cement,	Nitrate of Soda,
	Etc., Etc.

## REPRESENTATIVES

Our representatives are constantly traveling throughout the country, and it will please us to have them call upon you to advise concerning your bag problems. Your inquiries in this connection are requested.

## ACCUMULATED BAGS

Your accumulation of bags can be converted into money by letting us figure on them for you. We are always in position to pay top prices.



NEW ORLEANS FACTORY AND MAIN OFFICE

# FIDELITY CAN COMPANY

# FIDELITY

600 S. Caroline Street  
BALTIMORE, MD.

BRANCHES  
Chicago  
New York

## PRODUCTS

**Tin Cans, both plain and decorated, for liquids, syrups, powders, pastes, greases.**

**Wooden Boxes, and Box Shooks for tin or glass containers.**

## SERVICE

We will be pleased to submit sample designs for plain and decorated cans with estimates for making them up in thousand and carload lots.

For the benefit of those using large numbers of cans, yet lacking facilities to store a large reserve supply we will contract to deliver in quantities on a weekly or monthly basis.

## PLAIN CANS

We make up plain cans either round, square, oblong or oval with clinched, soldered or double seam bottoms and heads, or with special tops, such as screw, friction or sifting tops. The metal used for our plain cans is of the best quality and is free from rust. Each can is tested under water for leaks with air pressure of five pounds.

## DECORATED CANS

We are prepared to supply decorated cans of any size or shape with any of the standard or special tops. Each color is carefully baked before other colors are applied to insure stability of the color.

Care is exercised in making up our decorated cans to prevent scratching the finish.

## SPECIALTY CANS

We will confer with manufacturers regarding the best size and shape can. When buying cans consideration should be given to shape for boxing, weight of can as compared with weight of contents, metal consumption and economy. Our experience in these respects is at the disposal of users of metal cans.

## QUALITY OF MANUFACTURE

By using only the best tin plate and watching each operation carefully we are able to produce tin cans that will meet the most exacting requirements.

## SIZES

We make all sizes from the smallest ointment can up to and including the 5, 25, 50 and 100 gallon sizes.

## USES

Our cans are being used by numerous manufacturers for many products, some of which follow:

Paint	Ointments
Putty	Soaps
Cements	Spices
Dry Colors	Butter
Powders	Paste
Polishes	Lard
Grease	Candy
Ink	Varnish
Molasses	Drugs and Pharmaceuti- cals
Oysters	Herbs
Oils	Syrups
Tea	Coffee
Pigments	Oleomargarine
Adhesives	Tobacco

## WEIGHT OF METAL

The tin plate used in making Fidelity Cans is of the proper gauge to withstand pressures of bulk.

## STOCK

A large stock of flat sheets of all gauges necessary for can making is kept on hand.

We also maintain a reserve supply of standard sizes and shapes in both round and square cans.

## FACILITIES

We have three plants advantageously located to serve our customers, and we are in a position to furnish cans in hundred or carload lots, crated or bulk.

# FILTRATION ENGINEERS INCORPORATED

Consulting, Service and Sales Engineers F E <sup>INC</sup> Products

253 BROADWAY, NEW YORK, N. Y.

## PRODUCTS

Cake Compressor  
Non-Atomizing Wash  
Vacuum Discharge  
Chemical Dryer

### FILTER CAKE COMPRESSOR

This device is a new development, on which patents are pending, for the mechanical expression of the moisture from the cake on continuous drum filters.

**Advantages** Moisture content 50% under conventional operation. Spiral wire winding of filter cloth to drum eliminated, no reverse compressed air necessary for aiding discharge of cake, scraper can be located away from surface of filter and still obtain complete discharge of cake. Also vacuum pump requirements are cut 80% to 90% over those necessary with customary continuous filter operation.

### NON-ATOMIZING WASH FOR CONTINUOUS FILTERS

By using an absorbent belt on our Cake Compressor and applying the wash water across the belt from open troughs we are able to more thoroughly wash cakes than is possible with atomized sprays. The water is supplied in excess of the requirements, the excess being collected in a trough located under the lower idler so that none of it contaminates the strong liquor in the tank. We eliminate all "drifting sprays" and plugged up nozzles.

### CHEMICAL DRYER

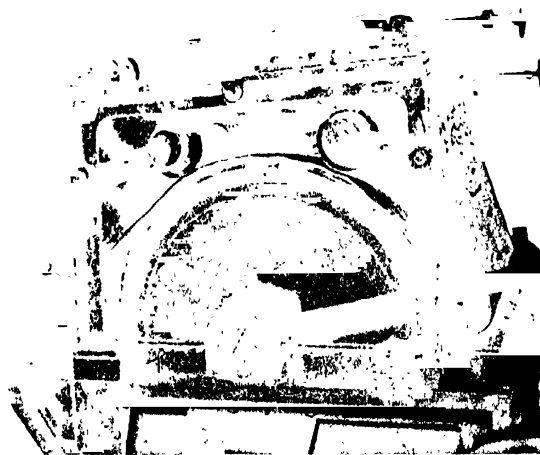
The Dryer, on which patents are pending, consists in reinforcing a conveying screen, made up into a continuous belt, in the compressed filter cake, formed on a continuous drum type filter. The cake so reinforced is conveyable and made to travel through a hot air drying chamber counter-current to the path of the hot air.

This is a radical departure in mechanical dryers, for the material is not fed as a wet cake but as a liquid filter slurry. The fundamental principle employed is a reduction of the



moisture content by mechanical means so as to reduce the duty of the dryer on the evaporation of the moisture entering the dryer. Most materials enter the dryer with 50% less moisture than the present day feed to conventional dryers. The high drying efficiency is obvious from the fact that the entire mass of the cake is carried through the dryer at a thickness seldom greater than  $\frac{1}{2}$ ", and the enormous evaporating area thus presented is augmented by the area exposed in the cracks developed by the cake turning pulleys, forming the festoons, etc.

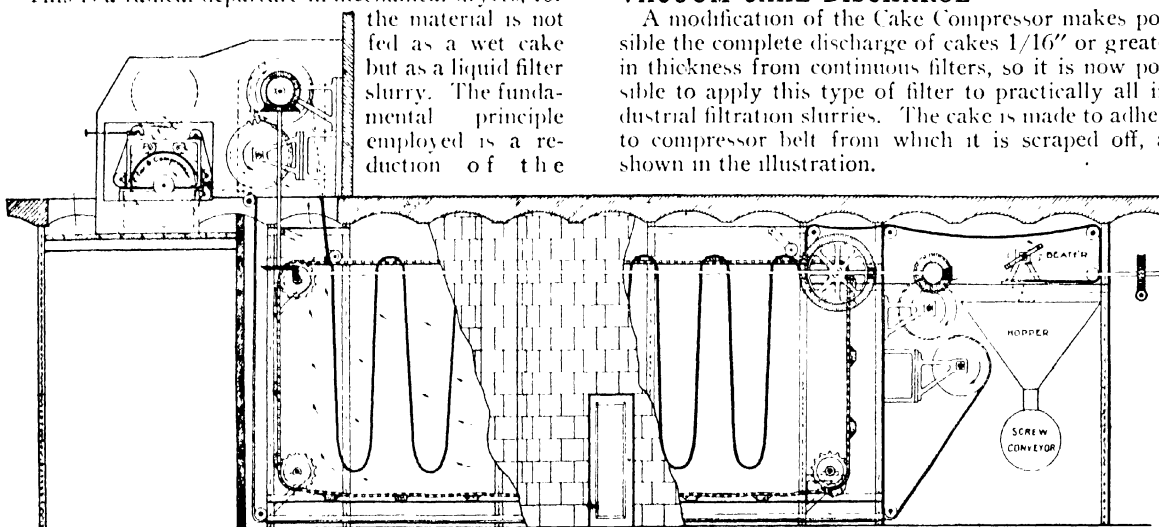
Many of the finest pulverized chemicals, such as ground whiting, 300 mesh plus, have been handled with entire freedom from premature discharge and on no material has more than .1 of 1% of the cake fallen prematurely.



"FEINO" FILTER CAKE COMPRESSOR  
Patents Pending

### VACUUM CAKE DISCHARGE

A modification of the Cake Compressor makes possible the complete discharge of cakes  $\frac{1}{16}$ " or greater in thickness from continuous filters, so it is now possible to apply this type of filter to practically all industrial filtration slurries. The cake is made to adhere to compressor belt from which it is scraped off, as shown in the illustration.



"FEINO" CHEMICAL DRYER

The design shown is applicable to any existing installation of drum type filters. It will be seen that none of the pulleys or compression rollers are driven and in practice the added power required for rotating the filter is undiscernible.

# FIDELITY CAN COMPANY

# FIDELITY

600 S. Caroline Street  
BALTIMORE, MD.

BRANCHES  
Chicago  
New York

## PRODUCTS

**Tin Cans, both plain and decorated, for liquids, syrups, powders, pastes, greases.**

**Wooden Boxes, and Box Shooks for tin or glass containers.**

## SERVICE

We will be pleased to submit sample designs for plain and decorated cans with estimates for making them up in thousand and carload lots.

For the benefit of those using large numbers of cans, yet lacking facilities to store a large reserve supply we will contract to deliver in quantities on a weekly or monthly basis.

## PLAIN CANS

We make up plain cans either round, square, oblong or oval with clinched, soldered or double seam bottoms and heads, or with special tops, such as screw, friction or sifting tops. The metal used for our plain cans is of the best quality and is free from rust. Each can is tested under water for leaks with air pressure of five pounds.

## DECORATED CANS

We are prepared to supply decorated cans of any size or shape with any of the standard or special tops. Each color is carefully baked before other colors are applied to insure stability of the color.

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## SPECIALTY CANS

We will confer with manufacturers regarding the best size and shape can. When buying cans consideration should be given to shape for boxing, weight of can as compared with weight of contents, metal consumption and economy. Our experience in these respects is at the disposal of users of metal cans.

## QUALITY OF MANUFACTURE

By using only the best tin plate and watching each operation carefully we are able to produce tin cans that will meet the most exacting requirements.

## SIZES

We make all sizes from the smallest ointment can up to and including the 5, 25, 50 and 100 gallon sizes.

## USES

Our cans are being used by numerous manufacturers for many products, some of which follow:

Paint	Ointments
Putty	Soaps
Cements	Spices
Dry Colors	Butter
Powders	Paste
Polishes	Lard
Grease	Candy
Ink	Varnish
Molasses	Drugs and Pharmaceuti-
Oysters	cals
Oils	Herbs
Tea	Syrups
Pigments	Coffee
Adhesives	Oleomargarine
	Tobacco

## WEIGHT OF METAL

The tin plate used in making Fidelity Cans is of the proper gauge to withstand pressures of bulk.

## STOCK

A large stock of flat sheets of all gauges necessary for can making is kept on hand.

We also maintain a reserve supply of standard sizes and shapes in both round and square cans.

## FACILITIES

We have three plants advantageously located to serve our customers, and we are in a position to furnish cans in hundred or carload lots, crated or bulk.



## W. L. FLEISHER & CO., INC.

Consulting and Contracting Industrial Engineers

31 UNION SQUARE WEST, NEW YORK, N. Y.



### PRODUCTS

**Air Conditioning Systems**—Humidifying, Dehumidifying, Heating, Cooling.

**Dryers for Solids**—Tray, Tunnel, Progressive.

**Spray Dryers for Liquids.**

### AIR CONDITIONING SYSTEMS

Increasing realization of the vital importance of constant atmospheric conditions in candy factories, textile mills, lithographic plants, bakeries, food packing establishments, etc., has resulted in a remarkable demand for Air Conditioning installations.

We are prepared to design and install complete humidifying, dehumidifying, cooling and air washing systems, guaranteed to maintain constant atmospheric conditions, regardless of variation in weather. These insure uniformity of product, maximum all year round production, and prevent both time and weight loss.

**Cool Climate and Low Humidity**—Casting troubles and graying of the chocolate are entirely prevented in candy factories by a properly designed dehumidifying system, insuring, by fool-proof automatic control, a Cool Climate, with Low Humidity for all Enrobing, Dipping and Packing rooms.

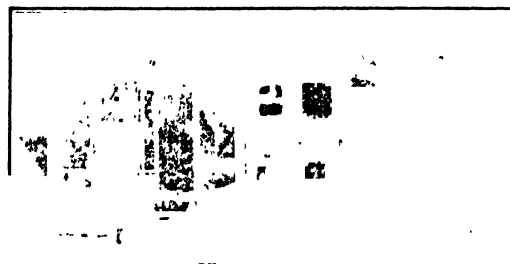


TYPICAL DEHUMIDIFIER INSTALLATION

In Hard Candy work graining is prevented, gumming precluded, and no shut-downs are necessary because of sticky candy and gummed-up machines, when a Moderate Climate with Low Humidity is maintained.

**Warm Climate with High Humidity**—The proper raising of dough in bakeries demands a Warm Climate with High Humidity. With such a climate delays in "raising" are prevented and maximum production insured, unhampered by hold-ups in the mixing and sponge rooms.

In textile mills, "fly" and thread breaking due to



TYPICAL HUMIDIFIER INSTALLATION

the development of static electricity are prevented by a moderate Climate with High Humidity.

**Cold Climate with High Humidity**—In cold storage work, as well as in yeast and oleomargarine packing and storage, a Cold Climate together with High Humidity is indicated. Such a combination gives maximum cooling with minimum danger from mold and drying out. We install special cold storage units which overcome all objections of the old-fashioned bunker coil systems.

**Warm Climate with Low Humidity**—For the successful drying of films and plates as well as photographic paper, a Warm Climate with Low Humidity is necessary to overcome emulsion puffing and detachment, and the air supply must be dust free.

### SERVICE

Any of the above climatic conditions can be supplied by our patented Air Conditioning systems which are both automatic and fool-proof.

Years of successful engineering in this type of work enable us to recommend, design and install highly efficient, economical equipment, guaranteed to maintain both the temperature and the humidity required.

A completely equipped chemical and engineering Laboratory in charge of highly trained specialists is maintained for the exclusive use of our clients, and before any installation is designed, a carefully conducted test under plant conditions is invariably made.

In addition, our experts are always ready to collaborate with those of our client, and the success of the actual installation is safeguarded by every precaution known to technical science.

### REFERENCES

We are prepared to submit references from a wide variety of industries, now equipped with our Air Conditioning systems and to arrange for personal inspections at plants where our installations may be seen in daily operation.

*Continued on Next Page*



## SPRAY DRYERS

In response to the persistent demand for an efficient and economical Spray Dryer, we have perfected and patented a dryer which will recover 100% of the solids contained in any solution, suspension or emulsion.

Materials of the most viscous nature as well as those having the characteristics of partially sun dried humus are spray dried quite as successfully as thin liquors.

## ADVANTAGES OF THE SPRAY DRYING PROCESS

Heretofore, it has been necessary for manufacturers to dry their products by carrying on the preliminary concentration in a single or multiple stage Evaporator, with subsequent transfer to a Vacuum Dryer for completion of the process. This was inevitable in the case of material which had to be dried at low temperatures, because of the danger of burning or coagulation or because low boiling point volatiles were apt to be driven off.

Such materials may safely be dried in the Fleisher & Company Spray Dryer, because the drying temperature is no higher than that maintained in Vacuum Evaporators generally.

Thermostatic control throughout makes the operation of the Fleisher & Company Spray Dryer automatic, thereby insuring a uniform product.

Work rooms are kept free of dust because of the slight vacuum maintained in the drying chamber.

Additional units can be added without interfering with the operation of units already installed.

The Fleisher & Company Spray Dryer can be adapted to the space available, is fool-proof, not subject to the operating weaknesses of the vacuum dryer and is a one-man machine.

## POWDER CHARACTERISTICS

Waters of crystallization can be entirely removed from practically all salts. Any percent of residual moisture may be left in the dry product; e.g., 12% in starch. Case hardening is prevented. The size of the dry powder particles can be varied within limits.

## PLACE IN INDUSTRY

Typical uses for Spray Dryer installation together with the saving in supplementary apparatus are shown in the accompanying Flow Sheet.

Steps marked A show the usual manufacturing procedure when a Vacuum Drum Dryer is used.

Apparatus which may be saved by taking the liquids directly to the Spray Dryer from the Vacuum Pan is shown in B.

If the technical treatment involves a Filter Press, as indicated in C, the use of the Spray Dryer after the

Precipitation Vats saves the use not only of Settling Vats and Filter Press, but Shelf Dryer, Grinding Mill and Screens as well. See D.

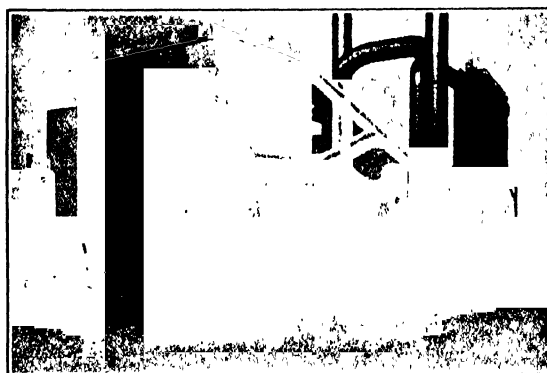
Liquids for which there is no need of either Precipitation Vats or Concentrators can be sent through the Spray Dryer directly. See E.

The saving in first cost through the installation of the Spray Dryer is not only considerable, but the subsequent saving in labor, energy and time of manufacture is, by comparison, enormous.

## SPRAY DRIED PRODUCTS

Among the various products which have been successfully dried in the Fleisher & Company Spray Dryer under plant conditions may be mentioned:

Orange Juice, Fruit Pectin and Lemon Juice, Potato and Banana Flours, Coffee as well as various coffee substitutes, Whole Egg in addition to Egg Albumen and Egg Yolk, Soups and Bouillons, both Whole Milk and Skim Milk, Molasses, Sugar, Lake Colors and Aniline Dyes, various Soap Powders, Starch, several Insecticides, Sulphite Pitch, Tannic Acid, Gallic Acid and Boric Acid, Precipitated Chalk, Lead Arsenate, and a wide variety of Sulphates, Acetates, Nitrates and Chlorides.



SPRAY DRYER INSTALLATION

A considerable number of pharmaceutical extracts containing low boiling point volatiles have been dried very successfully in the Fleisher & Company Spray Dryer and the resulting dry powders have not only been shown to be remarkably stable, but in several instances have been pronounced by the trade as distinctly superior to any dried powder product now on the market.

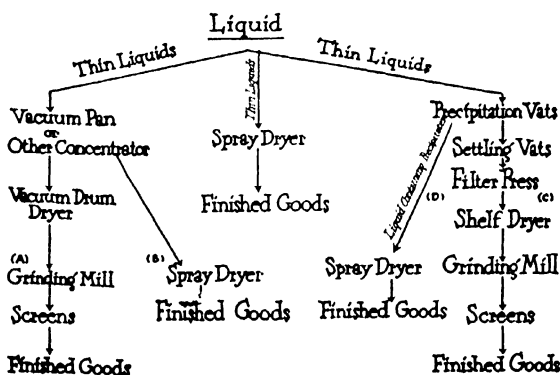
Waste liquors from a variety of chemical industries have been spray dried by W. L. Fleisher & Co., Inc., and at such a low cost as to permit of the conversion of noxious waste elements into a dry, compact, odorless and frequently valuable by-product.

## ENGINEERING SERVICE

A commercial size Fleisher & Company Spray Dryer is maintained at our testing laboratory for the free use of our clients and actual plant conditions are duplicated there for long, continuous runs. Complete engineering data is secured for every product and an estimate covering cost of installation and cost of drying per pound under conditions obtaining in our clients' plant are furnished gratis. No so-called "standard sizes" are made, but in every case the Fleisher & Company Spray Dryer is designed to fit the specific needs of the manufacturer.

## COVERING PATENTS

The entire process and apparatus of the W. L. Fleisher & Co., Inc., system of Spray Drying are covered by broad basic patents already granted and complete protection thereby assured.



FLOW SHEET

# FLETCHER WORKS

Incorporated  
FORMERLY SCHAUM & UHLINGER

## Centrifugal Extractors

Glenwood Avenue and Second Street

PHILADELPHIA, PA.

### PRODUCTS

Centrifugal Dryers, Extractors and Clarifiers for sugar plantation mills, Refineries, Beet Sugar Factories; Salt, Coke By-Product, Chemical and Textile Plants.

Centrifugal Dryers are used extensively for Sugar, Salt, Ammonium Sulphate, Anthracene, Naphthalene, Aniline Salts, Salicylic, Carbollic, Picric, Citric and Sulphonic Acids; Camphor, Glauber's Salt, TNT, Sodium Carbonate and Bicarbonate, Copper Sulphate, Silver Nitrate, Dyes, Starch, Terpene Hydrate, Hydroquinone and other chemical products.

Extractors for the Textile Industry for drying fibers and fabrics of all kinds.

Clarifying Centrifugals for precipitating suspended solids.

These machines save space, avoid the use of settling tanks and in many cases do away with filters and effectively expedite manufacturing processes.

Fletcher Multi-Cone Friction Clutch.

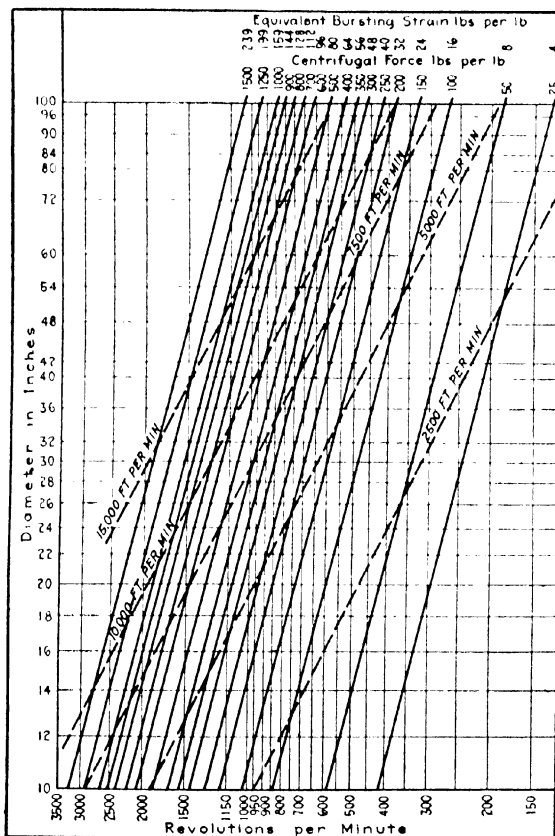


DIAGRAM FOR DETERMINING CENTRIFUGAL FORCE EXERTED IN BASKETS OF DIFFERENT DIAMETERS REVOLVING AT VARIOUS SPEEDS

### SALIENT FEATURES

Simplicity of design, and use of the best material obtainable make our centrifugals thoroughly reliable in operation. Correct proportions, ample bearings and reliable oiling arrangements are reasons why our machines are so long in service. We build machines not only to a wide range of sizes, but in a number of different types to meet various requirements.

### CENTRIFUGAL FORCE FORMULÆ

#### NOMENCLATURE

A = Sectional area in square inches  
d = Diameter in inches  
F = Centrifugal force in pounds  
g = Acceleration due to gravity = 32.16 ft. per second  
H = Centrifugal head  
N = Number of revolutions per minute  
R = Radius in feet  
S = Tensile strain in pounds per square inch  
V = Velocity in feet per second =  $1/30 N \pi R$   
V<sub>1</sub> = Velocity of outer surface of revolving liquid  
V<sub>2</sub> = Velocity of inner surface of revolving liquid  
V<sub>3</sub> = Velocity in feet per minute  
W = Weight in pounds  
 $\pi = 3.1416$

#### FORMULA FOR CENTRIFUGAL FORCE

$$F = \frac{WV^2}{gR} = \frac{WV^2}{32.16R} = \frac{W\pi^2 R N^2}{3600g} = \frac{WN^2}{2933} = 0.0003410WN^2 = 0.0001417WdN^2$$

#### FORMULA FOR TENSILE STRAIN IN REVOLVING BANDS

(Due to their own weight)

$$S = \frac{0.0001417WdN^2}{62832A} = \frac{0.00002255WdN^2}{A} = \frac{V^2}{3} \text{ times constant}$$

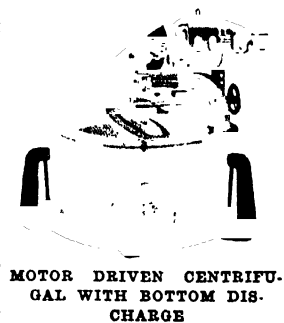
Constant for Copper	= 0.000432
" " Steel	= 0.000294
" " Wrought Iron	= 0.000288
" " Cast Steel	= 0.000270
" " Wood	= 0.0000225

### LABORATORY CENTRIFUGALS

Our laboratory centrifugal combines the advantages of three separate machines in one. It can be used as a self-balanced machine with perforated basket, or as a rigid bearing machine with solid wall basket for separating liquids of different densities; or fitted with a bottle holder it is used for precipitating samples in bottles. Although baskets and bottle holder are securely fastened to spindle when in use, the changes can be quickly made. Baskets of standard size are 12" diameter, 6" deep, with wall capacity of 360 cubic inches. Total capacity 660 cubic inches. Construction throughout is of sturdiest type. All parts are interchangeable. Base plate machined for A. C. or D. C. motors.

### "TEXTILE TYPE" EXTRACTORS

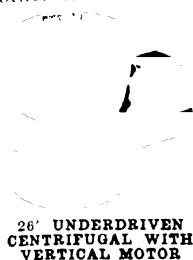
This type extractor, with bottom discharge feature, is popular for various lines of chemical manufacture. It gives thoroughly satis-



MOTOR DRIVEN CENTRIFUGAL WITH BOTTOM DISCHARGE

Continued on Next Page

factory service in removing excess moisture and liquor from naphthalene and other coal tar products; nitro-cellulose; hydroquinone; sulphonic acid and various other materials.



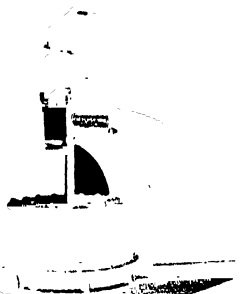
26" UNDERDRIVEN CENTRIFUGAL WITH VERTICAL MOTOR

These machines are made in six sizes, 30", 36", 42", 48", 54" and 60", with six methods of driving: Type A, side engine with friction cone; Type B, direct connected top engine; Type C, belt drive with friction cones; Type E, direct connected electric motor; Type G, side engine with planed gears, and Steam Turbine Drive.

This type extractor is built with or without bottom discharge. They are fitted with baskets of steel, plain, galvanized or rubber coated; or with copper baskets, plain or tinned. The curb is lined with sheet lead or rubber when required. The extractors are self-contained. Construction permits basket to be emptied of its load at any point.

### SUSPENDED AND UNDERDRIVEN CENTRIFUGALS

Fletcher Works heavy duty, bottom discharge centrifugals, both of the suspended and underdriven types, are the most extensively used machines of their kind for drying ammonium sulphate, naphthalene and other coke by-products in this country. They are of very strong construction and exceedingly durable. They are built for steam turbine, belt, electric motor or water turbine drive. Equipped with ball bearings throughout, or with ball thrust and bronze bushed radial bearings. Lubrication is ample. Baskets are built of steel, copper or bronze. Curbs are lined

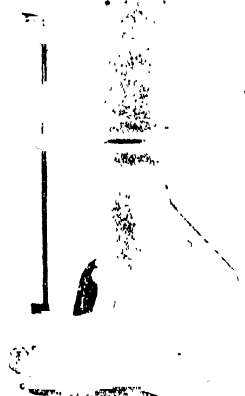


40" SUSPENDED CENTRIFUGAL WITH STEAM TURBINE DRIVE

with lead or copper if specified. An effective brake with easily removable asbestos lining is provided.

Standard size of baskets is 40". Average capacity, 8.33 cubic feet; wall load, total capacity, 17.5 cubic feet.

For the suspended type centrifugal we have developed a steam turbine drive which has all the advantages of the electric motor without its attendant danger of causing explosions in coke by-product plants. The turbine is as economical in opera-



40" UNDERDRIVEN CENTRIFUGAL

and eliminates entirely belt troubles and expense. Turbine is entirely enclosed. No belts or open parts.

Speed is closely regulated by reliable governor which is totally enclosed and free from tampering. Effectively lubricated and oversized ball bearings insure a light running machine and low power consumption. There are no packing boxes to stuff, no slide valves or piston rings to wear, or bearings to be taken up. There being no "dead center" as in a steam engine, the centrifugal can be started by simply turning on the steam and the basket quickly brought to speed without undue vibration. The turbine is not injured by a surge of condensed water coming over from the steam line, either when starting the centrifugal or while running at full speed. All parts being enclosed, there is no possibility of the turbine throwing oil.

For the underdriven centrifugals we build a special horizontal steam engine for use where an electric motor would be objectionable because of corrosive or explosive vapors.

FLETCHER WESTON SUGAR CENTRIFUGAL



### SUGAR CENTRIFUGALS

A suspended, ball-bearing machine with bottom discharge. The ideal machine where large quantities of granular material, such as sugar or salt, are to be handled. Mixer tank is equipped with stirrers, valves, brakes and clutches all designed in ample size for continuous operation. These centrifugals are usually mounted in batteries; can be discharged mechanically or by hand.

Built with 30", 36", 40" and 48" baskets.

Centrifugal force of approximately 550 times gravity is developed.

Baskets take 4.5 cubic feet, 6.5 cubic feet, 9 cubic feet and 10.8 cubic feet per charge respectively.

Baskets built of steel or bronze, with flat or sloping bottom, or self-discharging bottom.

Driven by belt, direct connected electric motor, hydraulic or steam turbine.

### CENTRIFUGALS FOR SPECIAL PURPOSES

We are frequently called upon to design machines to meet special conditions; and to make machines of special designs furnished by our customers. Our long experience in the manufacture of centrifugal machinery, together with our shop equipment and engineering force, enables us to give the best of satisfaction.

We solicit inquiries regarding the adaptability of our centrifugal machines to various processes, and will test materials and give our best advice without obligation on the part of those making the inquiry.



REAR VIEW SUGAR CENTRIFUGAL

# FLINN & DREFFEIN COMPANY

431 So. Dearborn Street, CHICAGO, ILL.

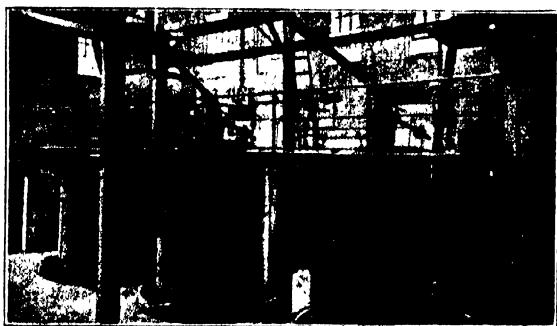
## PRODUCTS

Designers and Builders of Industrial Fuel Equipment:

Anthracite Producer Gas Plants  
 Bituminous Producer Gas Plants (Raw)  
 Bituminous Producer Gas Plants (Clean)  
 Mechanical Gas Producers  
 Gas Washing Apparatus  
 Tar Extractors  
 Raw Producer Gas Burners  
 Special Gas Apparatus for Making:—  
 Nitrogen, Carbon Monoxide, Carbon Dioxide.

## ANTHRACITE PRODUCER PLANTS

This type of apparatus is built for soldering tin cans, canning, etc. Also for hardening, tempering, annealing and heat treating of steel.

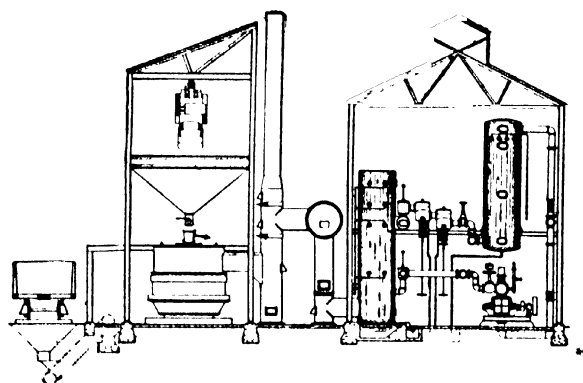


**ANTHRACITE PRODUCER PLANT**

Furnishing gas for bright annealing cold rolled steel, sherardizing, japanning and various operations formerly using city gas.

## CLEAN BITUMINOUS PRODUCER PLANTS

This apparatus finds its field in factories where heating operations are widely scattered and at considerable distances from the gas plant. It is the cheapest industrial fuel gas available and may be applied to almost every heating operation, as well as for gas engines.

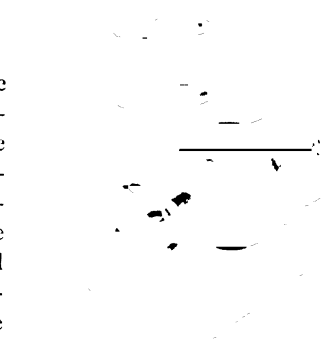


**GAS CLEANING PLANT**

In connection with a large Bituminous Producer installation.

## RAW PRODUCER GAS BURNERS

These burners can be applied to furnaces using fuel oil, coal or coke with virtually no material alterations. Combustion is complete within the furnaces and there are no objectionable fumes or smoke emitted. Furnaces are readily adapted to the use of the raw producer gas burners.

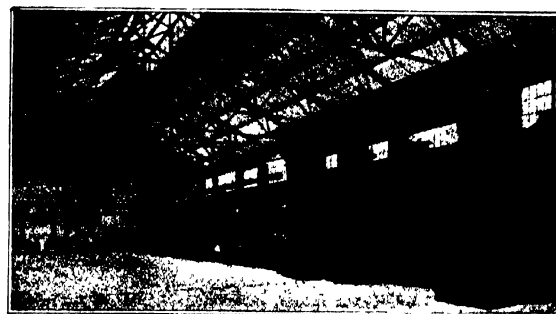


**FLINN & DREFFEIN RAW PRODUCER GAS BURNER**

For displacing oil, natural gas, coal and coke in a wide range of industrial heating operations.

## RAW BITUMINOUS PRODUCER GAS PLANT

This apparatus is especially suitable for heating reducing kettles, ovens, etc., as well as in all moderate temperature, direct fired furnaces, such as hardening, tempering, annealing and heat treating of steel.



**RAW BITUMINOUS PRODUCER GAS PLANT**

In combination with a complete burner system for heating a double battery of asphalt stills.

## SERVICES

For more than ten years, the Flinn & Drefflein Company has designed and built fuel equipments for industrial and manufacturing purposes, covering the entire range of heating and burner operations, and is in a position to offer only that equipment which is suitable to the manufacturer's needs. Fuel systems of its design can be seen in successful operation in many leading factories throughout the country.

## INFORMATION REQUIRED

In the nature of things, nearly every proposition must be specially considered before definite recommendations can be made regarding the apparatus involved. In writing, please describe as fully as possible the requirements, giving kind and quantity of fuel used and nature of heating operations to be performed.

# FORD CHAIN BLOCK CO.

Hoists and Trolleys

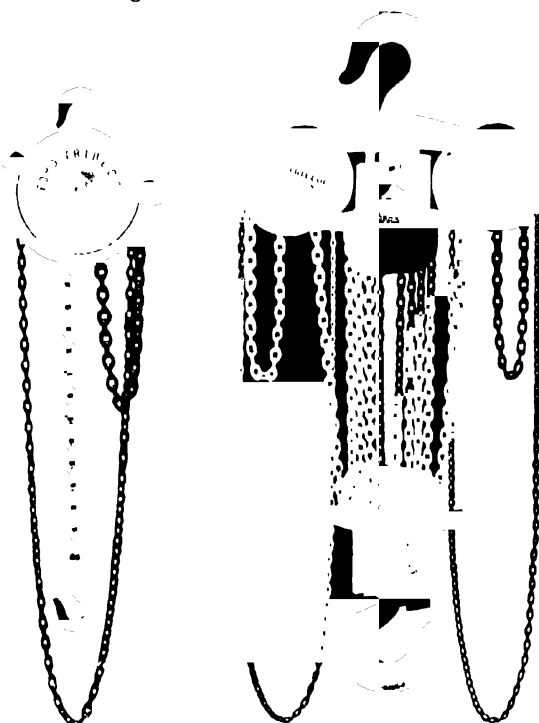
SECOND AND DIAMOND STS., PHILADELPHIA, PA.

## PRODUCTS

Spur Gear Chain Hoists, Differential and Screw Hoists, Plain and Geared Trolleys.

### FORD "TRIBLOC" HOISTS

**Advantages**—Among the advantages peculiar to the Ford "Tribloc" hoists are the following: the parts are simple and few; the gears are centered on the main bearing, producing balanced gear pressures; the gears are made of steel, covered by an independent dust-proof steel case; all other working parts are made of steel, including the hooks, chain and swivel, which are made of forged steel.



FORD "TRIBLOC"  
½ to 2 tons

FORD "TRIBLOC"  
12 to 20 tons

"TRIBLOC" CHAIN HOISTS

No.	Capacity		Hoisting distance		Reaching distance		Distance between hooks		Net weight		Chain pull to lift full load		Code word
	ton	lb.	ft.	m.	ft.	m.	in.	cm.	lb.	kg.	lb.	kg.	
1	½	900	8	2.4	9	2.7	13	33	33	24	62	28	ALLEG
2	1	1800	8	2.4	9.5	2.9	16	41	80	36	82	37	ALJOY
3	1½	2700	8	2.4	9.7½	3.0	18	46	124	56	110	50	ALGOT
4	2	3600	9	2.7	11.0	3.3	21	53	188	85	120	54	ALBOD
5	3	5400	10	3.1	12.8	3.9	24	61	200	91	114	52	ALDAY
6	4	7200	10	3.1	13.1	4.0	27	69	290	132	124	56	ALSOP
7	5	9000	12	3.7	15.9	4.8	30	76	380	172	110	50	ALTRY
8	6	10800	12	3.7	16.3	4.9	33	84	390	176	130	59	ALSTN
9	8	14400	12	3.7	16.9	5.1	36	91	470	213	135	61	ALKND
10	10	18000	12	3.7	17.1	5.2	39	99	800	363	130†	59	ATENT
11	12	21600	12	3.7	17.1	5.2	42	107	1000	454	135†	61	AYARD
12	14	25200	12	3.7	18.5	5.6	45	114	1375	624	140†	64	AGGYD
13	20	36000	12	3.7	18.5	5.6	48	122	1750	794	140†	64	...
14	24	43200	12	3.7	18.5	5.6	51	130	2100	953	140†	64	...
15	30	54000	12	3.7	18.5	5.6	54	138	2700	1225	140†	64	...

\* Height which blocks with regular lengths of chain will hoist above level on which operator stands.

† For each hand chain.

‡ Prices and full particulars sent upon application.

**Construction—Gears**—The use of steel planetary spur gears, instead of cast iron, maintains the highest possible efficiency, and prolongs the life of the hoist.

**Loop Hand Chain Guide (Patented)**—An endless steel loop, with fixed guide strips adjacent to the flanges of the wheel, extending from one guide to the other and conforming to the circumference of the wheel.

The advantages of this construction over the strap guide, ordinarily used, are (1) it protects the hand wheel and working parts from damage, (2) it effectually prevents "gagging" of hand chain and injury to block, even when hoist is operated at high speed, (3) it permits rapid travel of hand chain without over-riding the flange of the hand wheel and (4) it insures a safe and durable hoist.

The Loop Hand Chain Guide is furnished as standard equipment for Ford "Triblocs" in all sizes from ¼ to 20 tons.

**Chains and Hooks**—Are made from carefully selected steel stock having high tensile strength combined with great ductility.

**Inspection**—All parts are subjected to the most rigid inspection and test before being assembled.



LOOP GUIDE

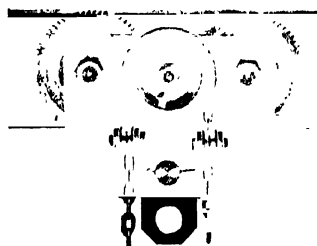
### DIFFERENTIAL AND SCREW HOISTS

Differential hoists are desirable for occasional use where efficiency and speed are not essential. Capacity ¼ to 3 tons.

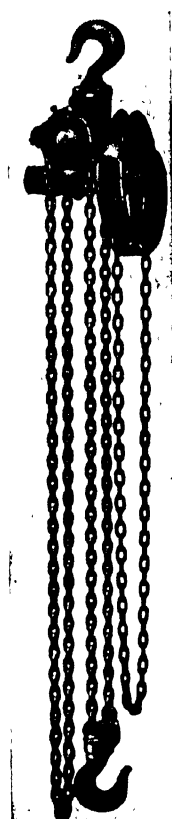
Screw hoists, although not as efficient as the Ford "Tribloc," are sometimes preferred for portable use, as they are much lighter and at the same time powerful and durable. Capacity ½ to 10 tons.

### STEEL PLATE TROLLEYS

Both plain and geared types carried in stock for immediate shipment. Made to fit any I-beam.



ROLLER BEARING STEEL PLATE TROLLEYS GEARED TYPE



SCREW HOIST DUPLEX TYPE

# FOAMITE FIREFOAM COMPANY

200 Fifth Avenue, NEW YORK, N. Y.

## BRANCH OFFICES

ATLANTA, GA.  
Foamite Firefoam Company, 125 Ivy Street  
BOSTON, MASS  
Foamite Firefoam Company, 813 Old South Bldg.  
CHICAGO, ILL.  
Firefoam Engineering Co., Dearborn and Lake Sts.  
CLEVELAND, OHIO  
Firefoam Co. of Ohio, 2133 East Ninth St.  
DENVER, COLO.  
Rocky Mountain Firefoam Co., 1109 Broadway  
KANSAS CITY, MO.  
Foamite Firefoam Company, 1012 Baltimore Avenue



PHILADELPHIA, PA.  
Atlantic Firefoam Co., 1509 Arch St.  
PITTSBURGH, PA.  
Firefoam Sales Co., 105 Wood Street  
ST. LOUIS, MO.  
Foamite Firefoam Company, 1014 Pine St.  
SAN FRANCISCO, CALIF  
Pacific Foamite Firefoam Co., Mills Bldg.  
HAMILTON, CANADA  
Canadian Foamite Firefoam, Ltd.  
LONDON, W., 1, ENGLAND  
Foamite Firefoam, Ltd., 65 South Molton St.

## PRODUCTS

Foamite Firefoam and Firefoam equipment, including:

Fire Pails  
Hand Extinguishers  
Portable and Stationary  
Engines  
Motor Transport Engines  
Automatic Sprinkler Sys-  
tems

Protective Systems (Spe-  
cial Installations for Oil  
Refineries, Tank Farms,  
Marine and Chemical  
Risks)

Special installations de-  
signed for extra haz-  
ardous risks

## OUR SERVICES

The firefoam method of extinguishing fire has reduced fire protection to an exact engineering calculation. When we know the nature of your fire risk and the number of square feet that require protection we can tell you what size and type of Firefoam equipment to install in your plant.

Our engineering department is organized to design complete automatic Firefoam Sprinkler Systems and Special Protective Systems for every industry where there are big dangerous fire problems requiring engineering talent for their solution. The Firefoam method reduces the chances of a destructive fire to the minimum and *assists in lowering insurance rates.*

Our Inspection Department never forgets about the Firefoam equipment you have installed. Not even a single Hand Extinguisher is overlooked. Furthermore, a thorough system of tabulating futures is maintained for the purpose of keeping Firefoam users informed as to the condition of their properties in relation to fire risks.

Both our Engineering and Inspection Departments are composed of engineers expert in fire prevention and protection. These engineers can solve your fire problems for all time, and adequately protect your property as well as the lives of your employees.

## DESCRIPTION

As a rule there is no such thing as an incipient fire where inflammable liquids become ignited. There is a flash, generally followed by an explosion,—then flames everywhere. The heat is most intense.

To provide real fire protection under such conditions, the capacity of the protective system must be commensurate with the risk involved. Firefoam is readily adaptable on the largest possible scale. Our Engineering Department designs systems specially suited to the conditions surrounding each particular risk.

Our policy is to allow a reasonable but ample factor of safety to cover every fire contingency. With the Firefoam System on guard, the chance of a disastrous loss, even in connection with the most hazardous risks, is reduced to a negligible item.

Firefoam is a fire-smothering, fire-extinguishing foam which covers all burning objects like a blanket. It puts out fire quicker than other extinguishing agents, and *prevents re-ignition.* It coats and clings to all surfaces, and floats on even the most inflammable liquids. It is effective against every kind of fire. Unlike water, it does not damage.

Firefoam has an extremely large covering capacity. When discharged it expands under self-generated pressure eight times its original volume. A three-gallon Firefoam Fire Pail will produce 24 gallons of Firefoam.

## APPLICATION IN CHEMICAL INDUSTRIES

The Firefoam System supplies complete protection to oil tanks and refineries and chemical plants, but is peculiarly adapted for installation in factories where inflammable substances are used in the process of manufacture. As many inflammable liquids are not miscible with water, the ordinary form of carbonic-acid gas extinguisher is more likely to spread the fire than to extinguish it. Firefoam floats on the surface of burning liquid, and there are no noxious fumes. Firefoam contains no substances which will injure the surface to which it is applied. It will not render a burning liquid unfit for immediate use.

## INDUSTRIES USING INFLAMMABLE LIQUIDS

The following industries use one or more highly inflammable liquid in the ordinary process of manufacture:

Acetaldehyde	Glycerophosphates
Alkaloids	Guaiacol
Artificial Silk	Hats
Artificial leather	Inks
Betanaphthol	Jewelry and watches
Barometer and Thermometer tubes	Lacquers
Benzoin acid	Leather
Brushes	Liniments
Celluloid	Mirrors
Chloroform	Moldings and frames
Cigars and cigarettes	Paint
Coal tar	Perfumes
Collodion	Phenacetin
Confectioner's colors	Phenolphthalein
Coumarin	Photographic films
Cutlery	Photographic chemicals
Dental alloys	Photoengraving
Deodorants	Pyroxylin plastics
Disinfectants	Pyralin articles
Drugs	Resorcin
Dyes	Rubber and rubber goods
Embalming fluids	Soaps
Ether	Shellacs
Ethyl anilines	Salol
Ethyl chloride	Smokeless powder
Ethyl esters	Shampoo paste and liquid
Explosives	Shoe polish
Filaments for lamps	Surgical goods
Formaldehyde	Trinitrotoluol
Fulminating caps	Varnishes
Furniture	Water colors and Wood finishes
Gelatine capsules	

*Continued on Next Page*

### FIREFOAM SYSTEMS

Firefoam Systems generally consist of large solution tanks and a central pumping station from which the Firefoam solutions are pumped through pipes to the most remote parts of a plant or building. These systems can be arranged for either automatic or manual operation or both as may be desired. They provide absolute protection against a destructive fire.

There are many rooms in chemical plants where the fire risk is as great as in oil refineries. The Firefoam System is now available to protect these hazardous fire risks just as it has protected even greater risks in the oil field.

### THREE-GALLON FIREFOAM PAIL

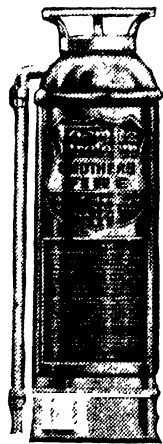
A most remarkable fire-fighting device—twenty-four gallons of Firefoam are spread on the fire by one of these pails. Compare three gallons of water with twenty-four gallons of Firefoam and you will appreciate why these pails are worth ten ordinary ones. For quick work on floor fires or fires in small kettles of inflammables, these pails are invaluable. No skill required to operate.



3-GAL. FIREFOAM PAIL

### HAND EXTINGUISHER

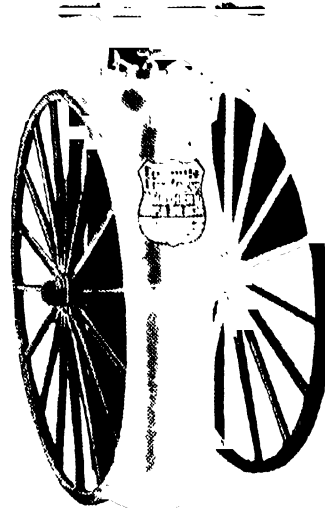
**Approved two and one-half gallon size**—Discharges 20 gallons of Firefoam under high pressure. Smothers quickly ordinary fires, oil and gasoline fires, enamel, varnish and chemical fires. Completely fire-proofs. No reflash—no rekindling. The fire is out to stay out.



2½-GAL. FIREFOAM  
HAND EXTINGUISHER

### FIREFOAM FORTY-GALLON ENGINE

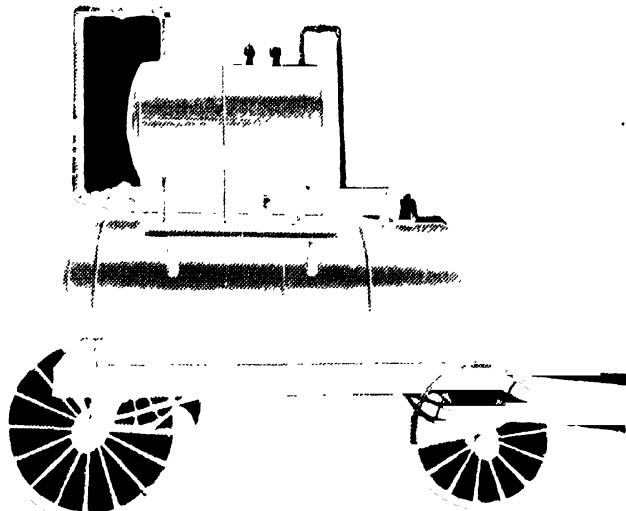
**Capacity**—Eight times its contents. This engine highly recommended for protecting dangerous fire risks in plants, buildings, and other places where hand extinguishers would prove of insufficient capacity. Its operation is simple. One man can handle it easily.



FIREFOAM 40-GAL. ENGINE

### FIREFOAM 250-GALLON ENGINE

**Also made in larger sizes**—This engine, with its great capacity, is designed especially for use in places in which are tanks of inflammable chemicals. It operates under self-generated pressure and is easily handled.



FIREFOAM 250-GAL. ENGINE

# FOSTER PUMP WORKS

Established 1860

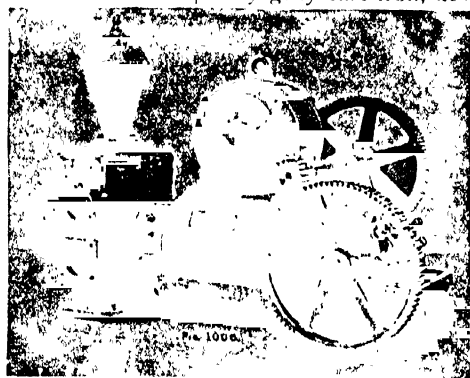
Manufacturers of Pumping Machinery  
36 BRIDGE STREET, BROOKLYN, N. Y.

## PRODUCTS

Pumps: Steam, Power, Boiler Feed, Pressure, Tank or Light Service, Brine, Ball Valve, Ammonia, Tannery, Food Products, Filter Press, Oil and Gasoline, Vacuum, Low and High Pressure, Air and Racking, Simplex and Duplex, Open Well, Artesian Well. Rotary Pumps—Steam, Electric, Gas, Oil Engine, Belt, or Hand Driven. Special Pumping Machinery.

### "FOSTER" MOTOR DRIVEN, SIMPLEX OR DUPLEX, PRESSURE AND LIGHT SERVICE POWER PUMPS

Construction—Cylinders, Caps, Air Chamber, and Power Frame of best quality gray cast iron, designed



MOTOR DRIVEN POWER PUMP

to withstand heavy stresses. Extra heavy Hard Bronze Linings in Cylinders, Piston Rods of Tobin Bronze. Piston is of Bronze. Stuffing Boxes of Cast Bronze. Valve Seats, Stems and Springs of hard Bronze. Crosshead is of Engine Type, Box Construction, fitted with Bronze Shoes, arranged for adjustment of wear. Crosshead Pin works in Bronze Renewable Bearings. The Crankshaft and Connecting Rods are of high Tension Alloy Steel. These Pumps are also arranged for Belt Drive, in which case a Tight or Loose Pulley is mounted on the Countershaft.

All Gearing is accurately cut. Their accuracy gives efficiency and a high degree of silence in operation.

They will give the greatest amount of pumping service for the investment, which their cost and installation represent. The quality of material, the workmanship and the excellence of design reduce maintenance and repairs to a minimum. Sixty years of pump building knowledge is at your disposal. Bulletin No. 1019 describes our power pumps.

### FOR BOILER FEED, FILTER PRESS, OR PRESSURE WORK

Diam. of Cylinder	Stroke	R.P.M.	Gal. per Single Stroke	Gallons per min.	Approx H.P. Required for 150 lb. pressure
Partial List of Sizes, Duplex Type—Motor and Belt Driven					
3	5	120	.153	74	7½
4	9	67	.489	130	15
6	12	50	1.468	290	30

### FOR GENERAL AND LIGHT SERVICE WORK

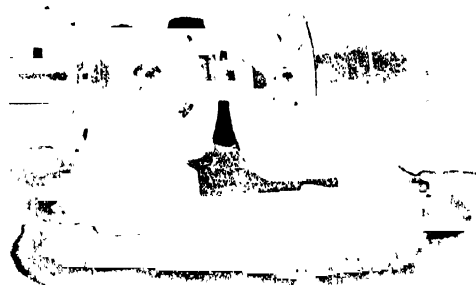
Partial List of Sizes, Duplex Type—Motor and Belt Driven					
3	5	120	.153	74	8
4	9	67	1.101	292	10
6	12	50	5.875	1168	35

## FOSTER "EXCELSIOR" POWER ROTARY PUMPS, BLOWERS AND VACUUM PUMPS

The Foster Rotary Pumps are ideal for the moving of large volumes of liquid against moderate heads. They are noted for their positive suction and discharge, no foot or check valves are required in the suction line. They successfully meet pumping conditions for which the reciprocating and the centrifugal types of pumps are unsuited, due to the inherent defects of these types.

Rotary Pumps are used successfully in Chemical, Paint, Varnish and Food Product Processes, Color Works and Oil Refineries. Only the best of material is used and the highest grade of workmanship only is tolerated. The name "Foster" is inseparably associated with Rotary Pump excellence.

Types—These Pumps can be supplied in Hand, Belt, Motor or Engine Driven types with flanged or threaded outlets and inlets, made in Iron, Bronze, or special metals to suit service requirements.



### BELT DRIVEN ROTARY PUMP

#### TABLE OF SIZES AND CAPACITIES

Type R1, suitable for fifty (50) pounds per square inch maximum pressure.  
Type R2, suitable for one hundred (100) pounds per square inch maximum pressure.

Pump No. Type R1	R.P.M.	Capacity G.P.M.	Pipe Sizes		Pulleys		Approx. H.P. Required Type R1	Approx. H.P. Required Type R2
			Suc- tion	Dis- charge	Diam.	Belt		
R1-0	260	15	3/4"	3/4"	9"	1 1/2"	1	1 1/2
R1-1	200	25	1"	1"	10"	2"	1 1/2	2 1/2
R1-2	200	33	1 1/4"	1 1/4"	12"	3"	2	3
R1-3	200	45	1 1/2"	1 1/2"	12"	3"	2 1/2	5
R1-4	175	90	2"	2"	14"	4"	3 1/2	5 1/2
R1-5	150	175	3 or 4"	3 or 4"	18"	6"	6 1/2	10

**Use**—They are being used with entire satisfaction in the Paint and Varnish Industries for pumping Paints, Shellacs, Lacquers, Enamels, Colors in Oil, Colors in Varnish, White Lead in Oil, White Lead in Paste, Naphtha, Kerosene, Turpentine, Tung Oil and Medium Pitches, also in the Oil Works and Refineries for pumping Crude Oil, Gasoline, Heavy Oil Residues, Lubricating Oil and Greases, for Food Product Manufacturers for pumping Milk, Fruit Syrups, Grain Mash, Molasses and other Sugar Syrups, Beverages, Beer, Beer Mash. In the Chemical Industries for Filter Press Work, both of the pressure and suction types, Acidulous Liquids, Alkaline Liquids, Soap, Starch mixtures, Gelatines, Glues, Paper Pulp, Ink, Water, Salt Water, Ammonia, Heavy Brine.

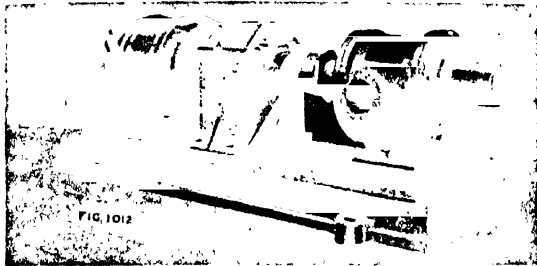
Bulletin No. 1001 fully explaining this unit sent on request.

*Continued on Next Page*



### FOSTER "EXCELSIOR" MOTOR DRIVEN ROTARY PUMPS, BLOWERS AND VACUUM PUMPS

These machines are equipped with Type R1 Rotary Pumps, suitable for fifty (50) pounds per square inch



MOTOR DRIVEN ROTARY PUMP

maximum pressure, and also with Type R2 Rotary Pumps, suitable for one hundred (100) pounds maximum pressure. In addition to the Rotary Pumps, these Motor Driven Pumping Outfits consist of a sturdy and efficient Gear Reduction Unit and Electric Motor, all mounted on substantial Iron Base. The advantages of this type equipment are many, among them being the low cost of installation and small floor space required. They are regularly furnished for floor mounting, but can also be furnished for mounting on ceiling or side wall, but will not be furnished for such mounting unless so specified in ordering.

**The Gear Case**—Consists of a Cast Iron Box and cover. The Reduction Gears consist of two (2) sets of Spur Gears. The Case is oil tight and Gears constantly running in Oil. The oil contained in the Gear Case also serves to lubricate all Bearings.

The Gears are accurately cut by the generator method on Fellows Gear Shaper, insuring maximum efficiency and silence in operation. The cover of the Gear Case is readily removable for inspection.

**Sizes and Capacities**—It is necessary for us to know fairly definitely for what service the pump is intended. Upon receipt of this information we can make recommendations and furnish quotations. The sizes and capacities for all Pumps for pressures up to 50 and 100 pounds per square inch are given in the table shown under **Belt Driven Rotary Pumps**.

Bulletin No. 1002 fully explaining this unit sent on request.

### MOTOR DRIVEN PUMP QUOTATIONS

Requests for quotations on all classes of motor driven equipment should include information covering voltage, whether A. C. or D. C. If A. C. phase and cycles

### HAND AND BARREL FILLING TYPES

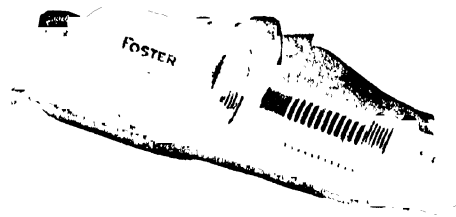
Rotary Pumps are also furnished provided with hand wheel drive for barrel filling and emptying and similar uses.

They can be obtained with either top or side outlet to suit piping layout. The Pump and Piping are furnished in Iron, but can be provided in bronze or monel metal for use in pumping water, chemicals, acids, etc.

### STRAINERS

All materials passing through pipe lines contain considerable foreign matter, which is highly injurious to manufacturing processes and machinery in use with such processes.

The use of a proper strainer will pay for its cost in a remarkably short space of time by reducing the repair bills of machinery to a minimum. It will also increase production.



TYPE W GENERAL SERVICE STRAINER

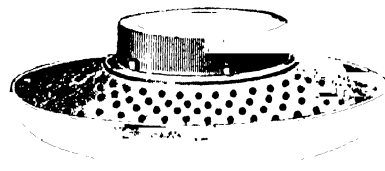
**Type W Strainer**—Type W Strainer will meet every ordinary need for a pipe line strainer. It can be quickly and easily cleaned of all trapped foreign matter, by the removal of the strainer element. No breaking of pipe connections necessary.

The direction of the flow through the strainer is the most direct possible.



TYPE F STRAINER

**Type F Strainer**—Type F Strainer has been developed to meet the need of a strainer that can be thoroughly and quickly cleaned after using. It is entirely removable from the pipe lines for sterilization.



TYPE B TANK AND PIT STRAINER

**Type B Strainer**—Type B Strainer is used on the end of suction lines, where desirable that contents of tank be removed without stirring up of the sediment in tank. Readily cleaned without removal by brushing off top of strainer element.

**Special Strainers**—Standard opening in Type W and Type F strainers are 1/16, 1/8 and 3/16. Special strainers can be furnished having woven wire cloth of any size or metal. Such strainers are suitable for the fine screening of liquids before entering filter presses, and their use in this way increases the production of the press.

**FOXBORO**

# THE FOXBORO CO., INC.

FOXBORO, MASS., U. S. A.

**FOXBORO**

New York  
50 Church Street  
Birmingham  
Brown Marx Bldg

Chicago  
Monadnock Bldg

BRANCH OFFICES  
Philadelphia  
809 Stock Exchange Bldg  
Tulsa, Okla  
213 S. Cincinnati Ave

Pittsburgh  
901 Park Bldg  
San Francisco  
461 Market Street

Montreal, Canada  
Pearce Bros

## PRODUCTS

### Gauges

Airplane  
Indicating  
Liquid level  
Mercury  
Pressure  
Recording  
Syphon  
Vacuum

### Gauge Boards

#### Pyrometers

Electric  
Indicating  
Recording

### Counters, round

### Recorders

CO<sub>2</sub> for flue gas analysis  
Differential pressure  
Electrical time  
Mechanical time

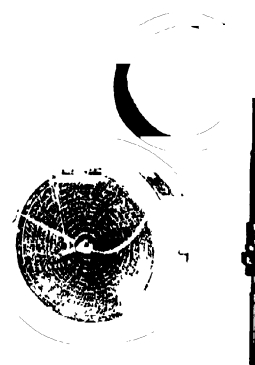
### Thermometers

Airplane  
Indicating  
Recording

### Clocks

Controllers, automatic temperature  
Indicators, air-speed  
Meters, flow for gas and liquids  
Planimeters, radial  
Psychrometers, recording

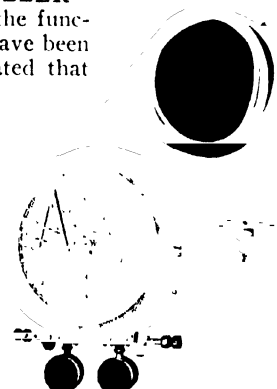
**Recording** — Used everywhere to provide an efficient check on important chemical operations. Permanency guaranteed. No multiplying devices used. Special lead and acid resisting bulbs made for chemical industry. Three sizes: eight, ten and twelve inches. Inverted pen. Latest improvements. Bulletin AZ-104-1, Indicating and Recording Thermometers, gives complete information.



RECORDING THERMOMETER

## AUTOMATIC TEMPERATURE RECORDER-CONTROLLER

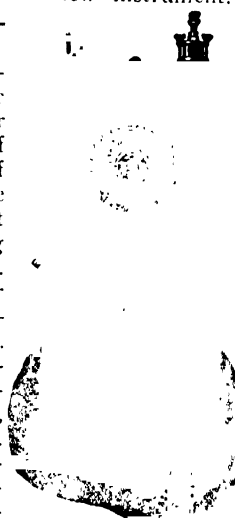
A new design in which the functions of two instruments have been combined and so coordinated that perfect synchronization is obtained. The use of only one bulb to actuate both the recorder and the controller elements gives an accurate record of the controller operation. Valves designed to operate on either pressure or vacuum. An improved form of rubber diaphragm motor is employed, which is so designed that, even under severe conditions, no undue stresses are set up in the diaphragm itself. Bulletin AZ-127 is all about this new instrument.



TEMPERATURE RECORDER-CONTROLLER

## FOXBORO-HEATH CO<sub>2</sub> RECORDER

In reality an automatic recording Orsat. A solution of caustic used for a reagent. Motive power obtained from constant flow of water and periodic operation of automatic syphon. Only three moving parts—clock movement for rotating chart, pen actuating float, and dotting mechanism. No glass to break, no rubber tubes to deteriorate; non-corrosive metal on working parts. Simple in construction, in operation and in maintenance. No mechanical adjustments to be made, and nothing to get out of order. Registers only the carbon dioxide content in flue gases. Bulletin AZ-114 gives full information.

CO<sub>2</sub> RECORDER

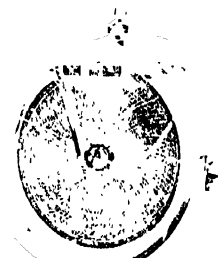
## GAUGES

**Indicating** — Movements entirely independent of case and absolutely non-corrosive. Perfectly aligned and permanently accurate. Sizes from two to twenty-four inches. Any range from full vacuum to 20,000 pounds. Bulletin AZ-95-2 gives complete information.



INDICATING GAUGE

**Recording**—For steam, gas, water, air, oil, ammonia, brine, or anything under vacuum or pressure. The improved supported helical and diaphragm tube movements and pen arms eliminate the effect of vibrations. All Foxboro recorders can be furnished with the inverted pen which eliminates the troubles caused by ink running down the pen arm. Bulletin AZ-98-1 gives complete information.



RECORDING GAUGE

## THERMOMETERS

**Indicating**—Long distance or stem types. Greatly superior to the glass bulb mercurial thermometer, one advantage being that excessive breakage is done away with. Bulbs are made of metal, and no mercury is used. The clear open scale permits of easy and accurate readings.



INDICATING THERMOMETER

# DISTILLATION INDUSTRIES, INC.

## Whitaker-Pritchard Distillation Process

52 VANDERBILT AVENUE, NEW YORK, N. Y.

### PRODUCT

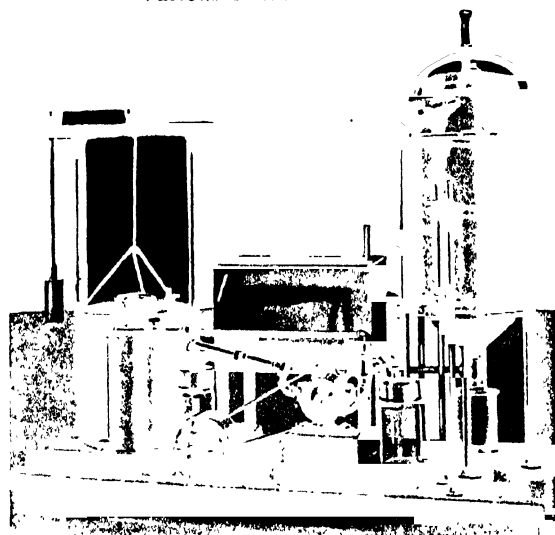
**Whitaker-Pritchard Destructive Distillation Process.**

### ADAPTABILITY

The process can be utilized for the destructive distillation of

Cannel Coal	Rice Hulls
Bituminous Coal	Grain Alcohol Waste
Lignite	Oil Sands
Peat	Tar Paper Waste
Oil Shale	Rubber Scrap
Wood (Resinous)	Patent Roofing Waste
Wood (Hard)	Asphalt
Bone	Garbage
Ivory (Vegetable)	Dried Blood
Ivory (Natural)	Linseed Meal Cake
Wood Waste (Sulphite)	Cocoanut Shells

Various Industrial Wastes



RESEARCH MODEL

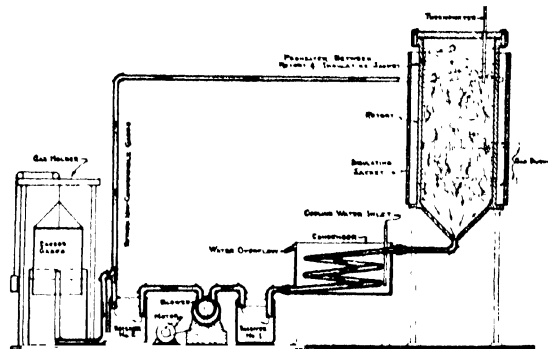
### APPLICATION OF LABORATORY MODEL

There are many instances in laboratories, both Research and Industrial, where destructive distillations are continually being carried out with makeshift apparatus that give inaccurate results, regardless of the most earnest efforts at accuracy.

The laboratory model of the Whitaker-Pritchard process of destructive distillation, has been built to replace makeshift apparatus with a model that is an exact duplicate of the industrial design. By means of this model equipment every detail of operation and chemical control can be had in any process of destructive distillation.

### PROCESS USED ON INDUSTRIAL SCALE

The equipment required for destructive distillation on a manufacturing scale is the same in principle as the Research model.



CROSS-SECTION OF MODEL DEMONSTRATING PRINCIPLE OF PROCESS

Standard Retort designs of either vertical or horizontal type are in use and are equally applicable to the process. From the condenser the vapors, or such as are not condensable, are carried to a blower or fan, and from there are forced through a superheater and returned to the retort. Passing through the distilling mass by means of their positive carrying power and sweeping effect they not only distribute the heat through the mass but act as a scavenger and carry out the vapors formed as rapidly as is desired.

The velocity of the gases through the retort provides a definite temperature control.

One of the striking features of this process is the fact that experimental results obtained with the laboratory model are duplicated when operated on a commercial scale.

### ADVANTAGES

(1) There is a definite temperature control during the entire operation. (2) The time of distillation is reduced at least one-third. (3) The quantity of distillates is increased, and in some cases this increase has been enough to pay for the entire operation. (4) The quality of the distillates is improved, are more uniform, and of a definite standard. (5) The distillates are more easily refined and the refining losses reduced.

### INSTALLATIONS

The Bone Char Products Co., Allentown, Pa., are using our process, under license, for destructive distillation of bone. The Acme Coal Products Co., New York, are licensees, under our patents, for the commercial application of this process to the destructive distillation of coal for the production of gas, coke and its by-products.

# FULLER-LEHIGH COMPANY

Manufacturers of Complete Powdered Coal Equipment. Pulverizing Machinery for All Refractory Materials. Chilled and Chemical Castings

MAIN OFFICE AND WORKS

FULLERTON, PA., U. S. A.

BRANCH OFFICES

New York, N. Y., 50 Church Street  
Seattle, Wash., 1915 L. C. Smith Building  
London, England, 25 Victoria Street, Westminster, S. W. 1

Chicago, Ill., 1336 McCormick Building  
Montreal, Canada, Canada Life Building  
Hamburg, Germany, "Wallhof", Glockengießerwall 2

## PRODUCTS

Pulverized Coal Equipment, including Pulverizer Mills, Dryers, Roll Crushers, and Pulverized Coal Feeders.

Gyratory Crushers, and Cone Heads and Concaves.

Jaw Crusher Plates.

Disintegrating Rolls.

Roll Shells for Roll Crushers.

Roll Heads and Rings for Roller Mills.

Ball Mills and Ball Mill Linings.

Tube Mills and Tube Mill Linings.

Muller Rings for Dry Pans.

Track Plates and Perforated Screens for Dry Pans.

Mixer Blades or Paddles.

Lining Plates for Chutes.

Conveyor Gudgeons and Bearings.

Sprocket and Traction Wheels.

Wire Rope Rollers and Sheaves.

Car Wheels and Axles.

Chilled Castings.

Repair Parts.

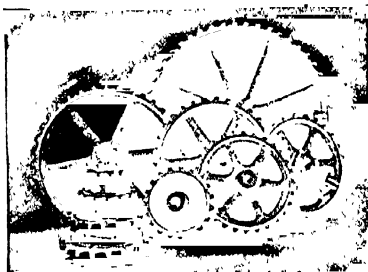
Conveyor Systems for Pulverized Material.

Chemical and Acid Heat Resisting Castings for all purposes; also special castings of all descriptions made according to specifications, up to 35 tons in weight; Nitric Acid Retorts, Caustic Soda Pots, Sulphuric Acid Concentrating Pans, Muriatic Decomposing Pots, Acid Eggs, Manheim Furnace Castings, Niter Pots, Desilverizing Kettles, Matte Pans, Lead Refining Kettles, Anode Molds, Slag Tapping Blocks, Cylinders, Vacuum Pans, Condensers, Pump Castings, Generator and Motor Castings, Cinder Ladles, etc.

## FACE HARDENED SPROCKET WHEELS

In developing our sprocket wheels we aim to produce a product giving longest life, and maintaining pitch diameter.

The teeth and rims of our wheels are specially hardened and treated, resulting in a smooth surface and engage the links without cutting. The wheels are perfectly fitted for the chains, insuring smooth operation and maximum efficiency for both wheel and chain.



GROUP OF FACE HARDENED SPROCKET WHEELS

## PUMP FOR CONVEYING PULVERIZED MATERIALS

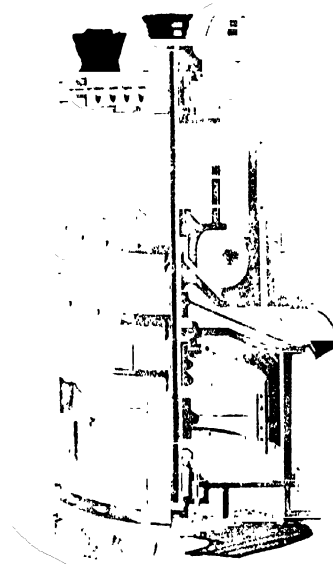
Pump for conveying pulverized material using standard size pipe as a conveyor line which may be run up or down grade making any number of bends. Simple and economical to install and operate. Its flexibility makes it adaptable to any existing or contemplated plant layout, while absolute dustlessness insures safety and comfort for workmen.



FULLER-KINYON PUMP FOR CONVEYING PULVERIZED MATERIALS

## FULLER MILL

Fuller Mill, a complete, self-contained, single reduction unit producing uniformly and finely pulverized material in one operation. Its rugged construction, low installation and operation costs make it especially desirable for pulverizing all kinds of refractory materials.

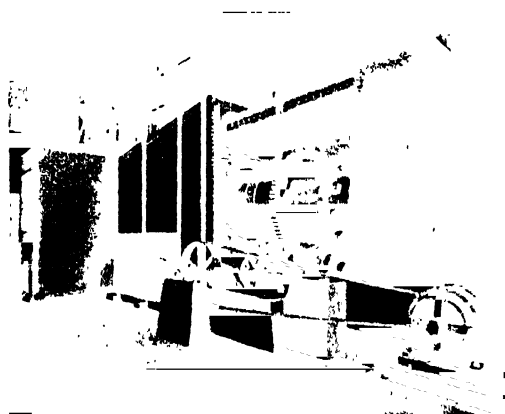


PULLEY DRIVEN FULLER MILL

*Continued on Next Page*

**INDIRECT FIRED ROTARY DRYER**

Indirect Fired Rotary Dryers are designed and built by experts who through years of research have determined the most efficient types to produce a maximum drying capacity with the minimum amount of fuel used.



FULLER-LEHIGH INDIRECT FIRED ROTARY DRYER

**CAUSTIC POTS**

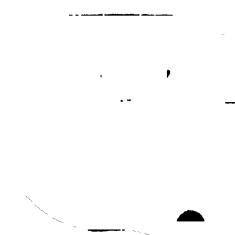
The majority of the caustic soda manufacturers of the country use "Fuller-Lehigh" caustic pots. Comparative tests with those of other manufacturers invariably leads to the adoption of the "Fuller-Lehigh." These kettles can be made of any size or preferred shape. Testimonials furnished on request.



CAUSTIC POT

**NITRIC ACID RETORTS**

The mixture used for these vessels is the result of experiments conducted jointly with one of the largest chemical companies of the world. No retorts are removed from mold until cold. They can be furnished either of the vertical or horizontal type.



NITRIC ACID RETORT

**ACID EGGS**

Made of special iron which experience has proven unexcelled for durability in this service. Tested in our shop to 300 lbs. pressure.



ACID EGG

**MANHEIM FURNACE CASTINGS**

Special foundry process, demonstrated mixtures, and ability to cast and machine extremely large sizes, result in benefits which the chemical trade is constantly finding to its advantage. Our records have not been approached by any manufacturer.

MANHEIM FURNACE CASTING

**SULPHURIC ACID CONCENTRATING PANS**

A yield of 400% and more beyond the general average obtained from other makes is the usual result of comparative tests in actual operation. Metal used in castings for this service is double the strength of best grades of cast iron, tendency toward cracking is therefore eliminated to a minimum. In density it is like chilled iron. They are practically "fool-proof." A large assortment of pattern equipment insures prompt execution of orders. The few renewals required where "Fuller-Lehigh" pans are used insure large operating economy.

SULPHURIC ACID CONCENTRATING PAN

SULPHURIC ACID PAN WITH LOOSE BAFFLE  
Pat. applied for

The largest oil companies in the world use "Fuller-Lehigh" products for this service.

Being the first company to make such pans, we are able to give users the benefit of long experience as regards both designs and mixtures. Repeat orders and long-term contracts from large users are testimony to wonderful results constantly being attained.

**SPECIAL CASTINGS**

Kettles and castings of any description, size or shape, are made according to customers' specifications, usually from skeleton patterns or sweeps. Estimates promptly and cheerfully furnished.

STATOR FRAME

**LOCATION**

Situated in the heart of the iron-producing section of the Lehigh Valley and in close proximity to coal mines and sand pits, gives this company a commanding position in the making of its products.

**MACHINE SHOP FACILITIES**

These include boring mills that will machine castings up to 17'5" diameter x 10' high, planer 6' x 22', radial drills, vertical and horizontal facing machines, large lathes, etc.

# THE FULTON COMPANY

Manufacturers of

*Sylphon* Sylphon Automatic Temperature Controlling Instruments  
KNOXVILLE, TENNESSEE

NEW YORK, N. Y.  
Hudson Terminal Building  
50 Church St.

DETROIT  
1247 Washington Blvd.

CHICAGO, ILL.  
Wrigley Building  
400 North Michigan Avenue

REPRESENTATIVES IN ALL PRINCIPAL CENTERS  
The Largest Plant in the World Devoted to the Manufacture of Thermostatic Instruments

## PRODUCTS

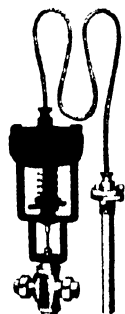
Patentees and manufacturers of Sylphon Products. Sylphon Packless Radiator Valves; Sylphon Hazardous Liquid Packless Valves; Sylphon Standard Pressure Packless Valves; Sylphon Temperature and Pressure Regulators; Sylphon Air Line Valves and other Sylphon Heating Specialties.

### TEMPERATURE REGULATORS

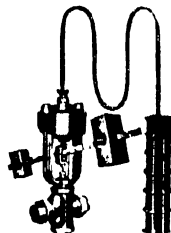
For nearly all requirements where liquids are heated by steam, and especially industrial uses, regulators are regularly furnished at a temperature range of 140 degrees to 180 degrees Fahr. Special regulators can be furnished with adjustment for 20 degrees above or below the operating point for temperatures not lower than 50° F. nor higher than 250° F. The No. 930 Regulator is the same as the No. 931, except that it has the lever and weight method of adjustment instead of the spring type shown here. The extreme sensitiveness, positive action and simplicity of these regulators have placed them in a class by themselves, and made them applicable in hundreds of ways. No. 931 Regulators are furnished regularly in sizes from 1/2" to 2 1/2" inclusive, and the No. 930 Regulator in sizes from 1/2" to 5" inclusive.

No. 980 and No. 981—To automatically control temperature of air in dry rooms, etc., and can be furnished with the same temperature ranges as shown on our No. 930 and No. 931 Sylphon Temperature Regulators. The thermostatic bulb, of our own special design, is so constructed that it may be placed at any point in the room in which the air is to be controlled, and is connected with the operating valve by a flexible tube of any required length. It is furnished in either the lever and weight type, similar to the No. 930, or the spring adjustment type, similar to the No. 931. The latter is designated as our No. 981.

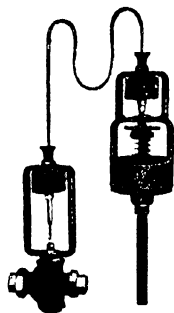
No. 932—This regulator, known as our detachable tube type, is composed of three distinct and separable units. These units are made so that each may be separately replaced or removed for repairs, as the case may be. If the flexible tubing should become damaged or broken, the power transmitting unit may readily be replaced by loosening two lock nuts, and the repair part slipped into place. The operation is similar to the No. 930 and No. 931 instruments. Ask for Bulletin CT-102.



TEMPERATURE  
REGULATOR  
NO. 931



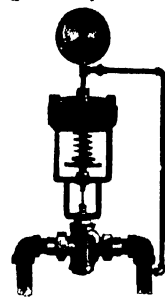
TEMPERATURE  
REGULATOR  
NO. 980



TEMPERATURE  
REGULATOR  
NO. 932

### PRESSURE REGULATOR

This regulator will reduce and regulate pressure from any initial pressure to any pressure under 40 pounds and maintain it steadily without any fluctuation. Its extreme sensitiveness makes it possible to reduce the pressure to as low as 2 pounds. The instrument has the spring method of adjustment as used in our No. 931 Sylphon Temperature Regulator. With this regulator it is possible to take the controlling pressure from any desired point. Ask for Bulletin CT-102.

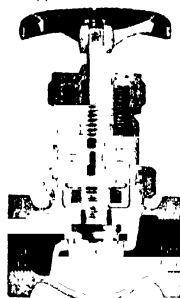


PRESSURE REGU-  
LATOR NO. 952

### STANDARD PRESSURE PACKLESS VALVE

This valve embodies all essentials of high grade construction, eliminating the greatest fault of all other valves, **Leakage and Frequent Repacking.** The disc and seat are of special alloy, both renewable, and can be ground without removing the body from the line.

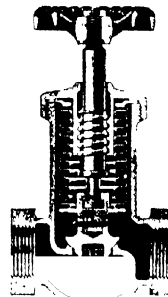
Now, note the construction—the phosphor-bronze Sylphon, surrounding the stem and turning parts, forming an ever tight barrier to leakage of steam around the stem, **no packing**, hence no need for **repacking.** The only real advance in valve construction for many years, and is the result of satisfactory service rendered for more than a decade by the Sylphon Packless Radiator Valves for low pressure heating work. Ask for Bulletin CPV-3.



STANDARD PRESS-  
URE VALVE  
NO. 304

### HAZARDOUS LIQUID VALVES

These are designed for use, as the name suggests, in connection with the handling of gasoline, naphtha, etc., under pressures up to 50 pounds. The usual valve stem packing is eliminated by the use of the Sylphon bellows surrounding all moving parts. Approved and recommended by the Underwriter's Laboratories (No. M. H. 788). Ask for Bulletin CPV-2.



HAZARDOUS  
LIQUID VALVE  
NO. MH788

### SPECIAL NOTE

Send for our "Specifications of Value" which give complete engineering data of the above products.

### ADVANTAGES

All Sylphon devices embody the seamless, one-piece bellows of drawn metal shown above. There is not a bit of solder throughout its length—no chance for leaks or breaks. It is a feature found exclusively in Sylphon Products.



METAL  
HEART OF  
EVERY  
SYLPHON  
PRODUCT

J. M. LUMMIS, Sales Mgr.

ESTABLISHED 1874

L. A. LUMMIS, Asst. Sales Mgr.

**GAYNER GLASS WORKS****Manufacturers Battery Jars, Demijohns, Carboys****Sales Office, 149 Broadway, NEW YORK, N. Y.****WORKS  
SALEM, NEW JERSEY**Telephone  
CORTLANDT 4146-3041**PRODUCTS**

**Battery Jars, Acid Bottles, Carboys, Demijohns, Seltzer or Packing Bottles, Water Bottles, Large Storage Containers, and Other Large Glass Specialties.**

**ACID BOTTLES**


Either narrow mouth or wide mouth with ground glass stoppers, in half gallons and larger.

**BATTERY JARS**

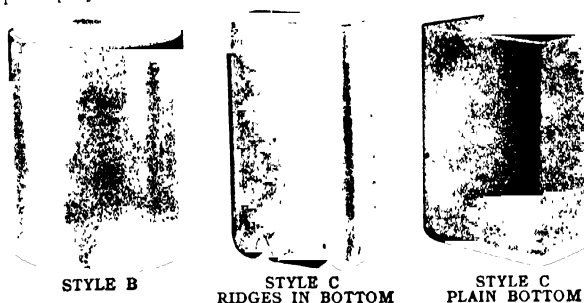
We have made a specialty of these for years. We are the largest manufacturers of this class of ware in the country and can furnish most any size or style desired. We carry large stocks of standard sizes. Special sizes or designs developed and furnished promptly.



**WIDE MOUTH GLASS STOPPERED ACID BOTTLE**



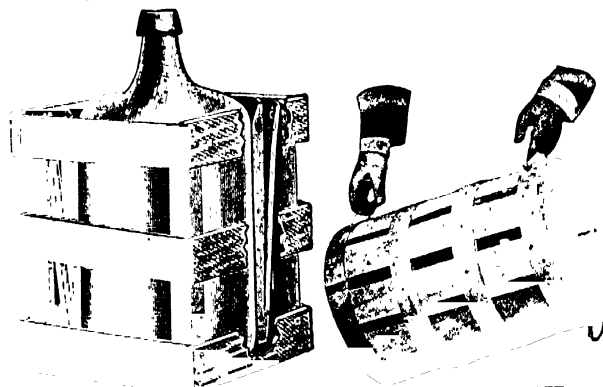
**NARROW MOUTH GLASS STOPPERED ACID BOTTLE**



STYLE B

STYLE C  
RIDGES IN BOTTOMSTYLE C  
PLAIN BOTTOM**WATER BOTTLES**

These range in various sizes, shapes and styles of finish from  $\frac{1}{2}$  gallon to 5 gallons. Can be made from private moulds or lettered from our stock plate moulds. Can also supply the special spring water crates. We pay particular attention to the tempering of this ware and our water bottles are found to stand the severe service given them with entire satisfaction. We carry large stocks and can make shipments promptly.



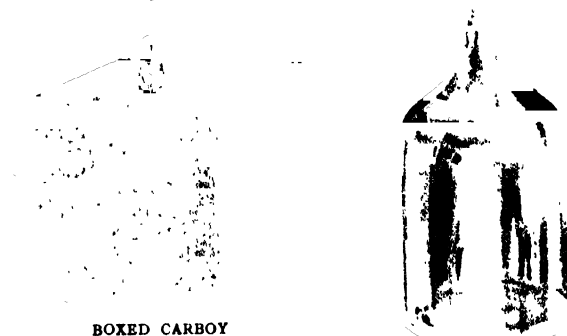
SPRING CORNERED CRATE

SPECIAL ROUND CRATE,  
TYPE A**PACKING**

All goods are packed in well made crates and in a manner to insure delivery with minimum breakage. Special packing for export shipments on any of our products.

**CARBOYS**

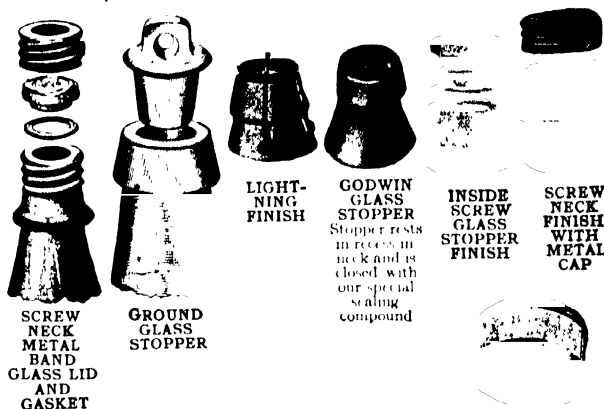
All sizes with any style finish desired. Boxed to suit the trade requirements or shipped in bulk. Well made, properly tempered, carefully tested and complying with the I. C. C. Specifications.



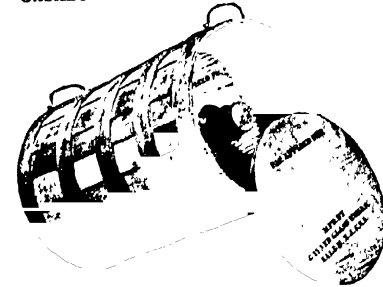
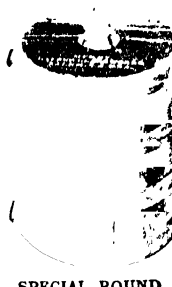
BOXED CARBOY

STRAIGHT SIDE  
IRON MOULD CARBOY**FINISHES ON CARBOYS**

When desired we can furnish special style finish on carboys as shown below:

SCREW  
NECK  
METAL  
BAND  
GLASS LID  
AND  
GASKETGROUND  
GLASS  
STOPPERLIGHT-  
NING  
FINISHGODWIN  
GLASS  
STOPPER

Stopper rests in recess in neck and is closed with our special sealing compound

INSIDE  
SCREW  
GLASS  
STOPPER  
FINISHSCREW  
NECK  
FINISH  
WITH  
METAL  
CAPSPECIAL ROUND CRATE,  
TYPE BSPECIAL ROUND  
CRATE, TYPE C  
WITH HOOD**SPECIAL ROUND CRATE**

This is our new patented crate, extremely strong but very light. Different designs suitable for any purpose. Especially adapted to the use of the pharmaceutical trade. Ideal container for domestic and export shipments.

# WILLIAM GARRIGUE & COMPANY

Designers and Manufacturers of Chemical Machinery

Specialists in Oils, Fats, Soap and Glycerine

154 NASSAU STREET, NEW YORK

WESTERN OFFICE AND PLANT: 45th Street and Western Blvd., Chicago

## PRODUCTS

### Complete Plants for:

Oil Extraction and Degreasing  
Fatty Acids Distillation  
Crude, Dynamite and Chemically Pure Glycerine  
Evaporation in Single or Multiple Effects  
Edible Oil Refining, Deodorizing and Bleaching:  
Oil Hardening and Vegetable Margarine Manufacture  
Fat Splitting, Stearic Acid and Red Oil  
Garbage Reduction and Rendering  
Causticizing Soda Ash  
Laundry and Toilet Soap and Soap Specialties

### Special Apparatus:

Dryers, Stationary and Rotary; Extractors; Stills; Kettles; Digesters; Autoclaves; Tanks; Condensers; Coils; etc.

### Engineering Service:

Complete Estimates on Equipment, Design and Arrangement of Plants and Installation and Operation of Apparatus.



Among the definite contributions we have made to the industries in which we specialize are the following:

1. The principle of double effect glycerine distillation.
2. Separation of trimethyleneglycol from glycerine.
3. The recovery of dynamite glycerine from cotton-seed soap stock spent lyes.
4. Reversible double effect evaporation for spent soap lye.
5. The combined evaporation of caustic soda, lye and spent soap lye in triple effect.
6. Direct autoclaving of cotton-seed soap stock before distilling fatty acids.

We have also made decided improvements in the construction of vacuum evaporators, solvent extractors, fatty acid stills and soap machinery.

## OIL EXTRACTION OR DEGREASING PLANTS

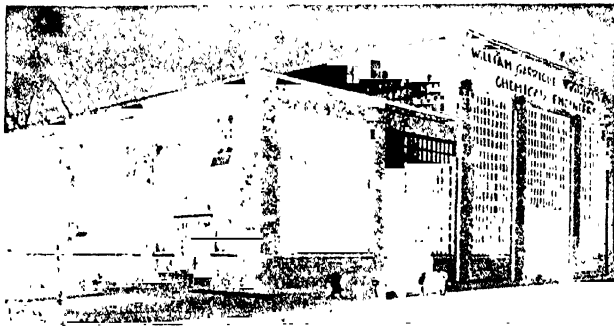
Garrigue extraction plants are suitable for two classes of service: (1) direct extraction of edible oil from copra, peanuts, corn germs, castor beans, soya beans, or any other oil bearing seeds; and also from

## ENGINEERING ORGANIZATION

William Garrigue & Company maintain a staff of chemical and mechanical engineers who—in addition to being graduate engineers—have also had many years of practical experience in the lines in which we specialize.

These men are available for solving the problems of our customers, and for supervising the erection and operation of the installations which we undertake.

We do not confine our efforts to the sale of our own apparatus and it frequently happens that we can make simple alterations in an existing plant to increase capacity, reduce losses, save fuel, or in some other way improve the process.



WILLIAM GARRIGUE & COMPANY, CHICAGO



GARRIGUE OIL EXTRACTION PLANT

oil cakes; (2) extraction of inedible oil from fuller's earth, animal tannage, garbage and bones.

In the manufacture of glue a great improvement can be made in the quality of the product by installing a Garrigue extraction plant to precede the glue boiling operation.

The Garrigue extractors are built in two types, one for the coarser material, such as bones, being a vertical cylinder, and the other for fine materials such as oil bearing seeds, being a horizontal rotating cylinder. The remainder of the plant consisting of still, condenser and storage tanks is practically identical.

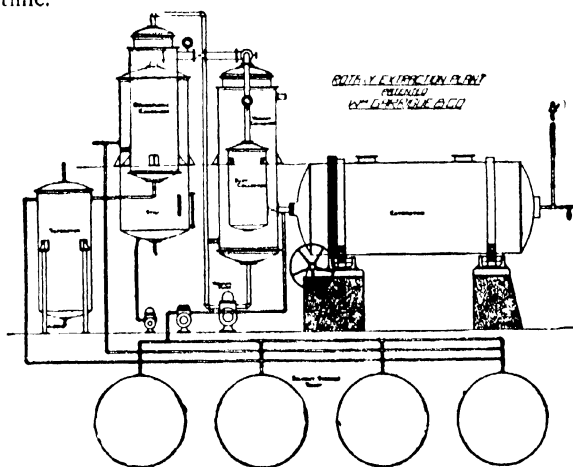
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tical for both forms. A considerable number of these plants utilizing a variety of solvents are in successful operation in leading industrial establishments.

The illustration shows a plant with a single revolving extractor, although two or more extractors are frequently used. The extractor is operated under a vacuum. It is constructed with a steam manifold at one end.

The steam manifold has a series of boiler tubes fastened to the shell of the extractor and extending throughout its length. Steam from the manifold enters these tubes which serve to heat the solvent, to vaporize it and to dry the charge if necessary. At the center of the steam manifold is a rotary valve connected with a series of perforated pipes lying along the shell of the extractor between the heating tubes. The valve is constructed so that only the two lower perforated pipes are open to the steam at any one time.



The extractor is charged and then flooded with the solvent. After revolving a short time the solvent is pumped away through the filter to the storage tank feeding the still. The flooding of the charge is repeated several times to insure thorough extraction, the two middle storage tanks receiving this partially saturated solvent which is returned to the extractor on the following charge.

The last charge is always made with clean solvent. In installations having two extractors, during the extraction in one machine the other one is being worked

for recovery of remaining solvent. For this reason it is always best to install two extractors when it is advisable to render the process continuous, which is usually the case.

The solvent remaining in the extractor is vaporized with the dry steam in the tubes until most of it has been expelled, after which live steam is let in through the rotary valve and the perforated pipes, steam in the tube system being continued to prevent condensation in the material. The tumbling of the material speedily frees all of the solvent which passes with steam to the condenser.

The still is fed with the solvent removed from the first charge, which also is steamed to remove the last traces of the solvent. The solvent and steam together condense and flow through the separator into the clean solvent storage tank, the water automatically passing out through an overflow.

During recovery of the solvent, the extractor and the still, in the apparatus here shown, are operated under vacuum. Both oil and residue are obtained free from solvent.

A considerable saving in steam is effected by this type of extractor, due to utilizing the latent heat of steam in the tubes for recovering the solvent from the extracted material as against having to vaporize it with only the superheat of steam, as in the case of the vertical stationary extractor.

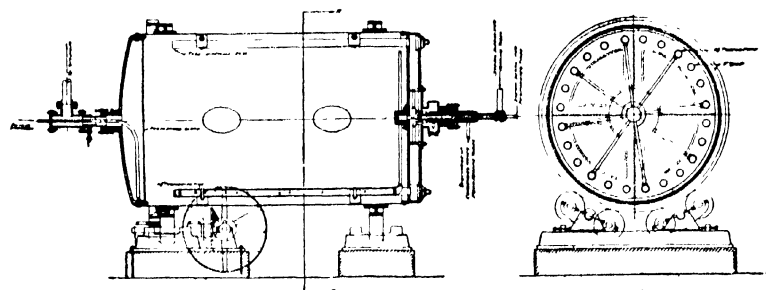
The material can be delivered with any percentage of moisture desired and the labor of emptying is entirely done away with.

### SPLITTING OILS AND FATS

We build two classes of plants for splitting oils and fats:—The Autoclave plant (such as that shown in the illustration) and the Twitchell process plant. Whether the Autoclave process or the Twitchell process is more advantageous depends on the use to which the fatty acids are to be put.

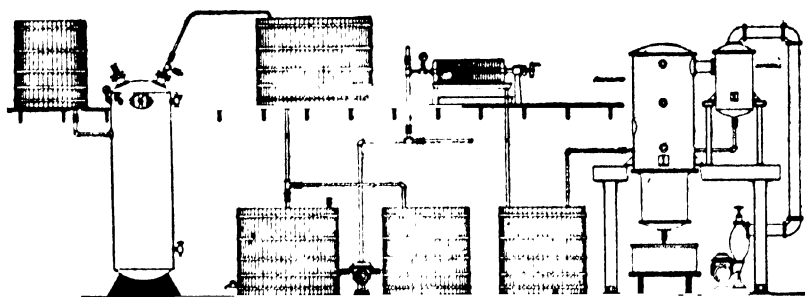
The Autoclave plant serves either to split oils of good color obtaining white colored fatty acids without distillation, or else for splitting lower grade fats and oils, which are later distilled to produce light colored stock. When a light colored fatty acid is desired directly from stock, zinc oxide is used in the Autoclave, and for soap making purposes the zinc need not be removed from the product. If the final product is to be stearic acid the zinc is replaced with lime, or if zinc oxide is used it may be recovered for re-use.

When the color of the fatty acids is not of importance, and when it is intended to distil them afterwards, caustic soda or lime is used in the Autoclave in place of zinc oxide.



GARRIGUE REVOLVING EXTRACTOR (PATENTED)

*Continued on Next Page*



GARRIGUE AUTOCLAVE PLANT FOR FAT SPLITTING (PATENTED)

The glycerine waters from the splitting plant can afterward be recovered in Garrigue glycerine recovery equipment as described on page 499. The illustration of the Garrigue Autoclave plant for fat splitting shows a suitable glycerine recovery equipment operated in connection therewith.

When it is desirable to use Twitchell process, we install complete Twitchell plants, including equipment for making the Twitchell Saponifier. These plants are usually installed when the color of the product is not a prime consideration.

#### FATTY ACIDS DISTILLATION

This process is applicable in the soap and stearic acid industries for the production of light colored fatty acids from recovered fats and refinery foots too dark to employ directly in soap making. The principal sources of raw material are cotton-seed soap stock, garbage grease, naphtha grease and dark bone grease and tallow.

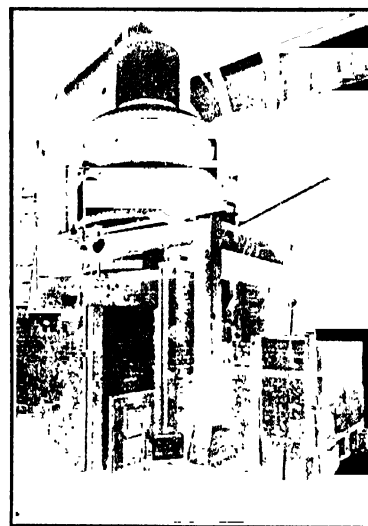
A Garrigue plant for fat splitting followed by a Garrigue fatty acid distillation set, as shown in the illustration, gives a complete plant for working cotton-seed soap stock, etc., into distilled fatty acids and crude glycerine.

The soap stock is charged into the Autoclave and digested with steam only, and then blown into a lead-lined tank and boiled with sulphuric acid until the black fatty acids clear. The acid water is drawn from below the fatty matter to the glycerine tank, where it is

neutralized with lime and filtered, after which it is treated in a manner similar to spent soap lyes, described under another heading. The black fatty acid is washed, and dried in the feed tank, and then fed continuously to the vacuum still, which is heated by direct fire and supplied with open superheated steam. The fatty acids distil, leaving a residue of "candle tar" or "stearine pitch." In the cases of grease or tallows, lime or caustic soda is added to the autoclave.

Garrigue fatty acid stills are of improved construction. A special furnace design is used in order to obtain uniform heat over the bottom of the still. This feature, together with our improved steam distributing system results in increased yield, improved color and fuel economy. The valve and control mechanism is also exceedingly simple and convenient.

The art in this operation is the production of a distillate as free as possible from color and odor and the obtaining of the maximum yield of fatty acids and the minimum yield of

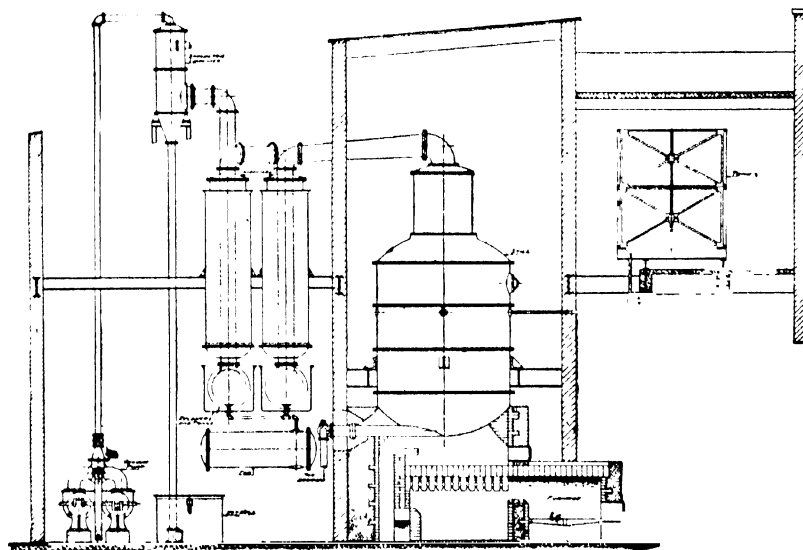


GARRIGUE FATTY ACIDS STILL (PATENTED)

pitch. The art in construction, in addition to facilitating these, is to keep down repairs and depreciation, which can readily run into very high figures.

#### STEARIC ACID AND RED OIL PLANTS

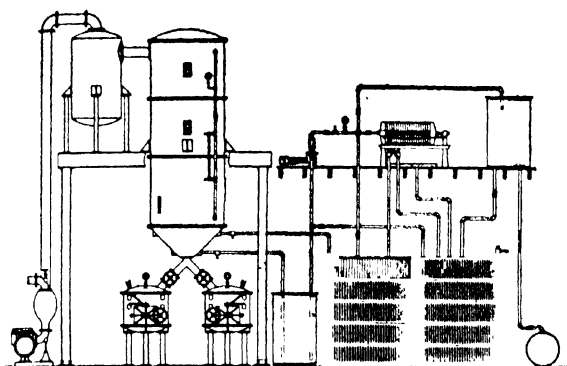
We design complete plants for the production of all grades of red oil and triple pressed stearic acid. Our many years of experience in designing plants for this purpose enables us to lay out plants and supply the necessary equipment to attain the best results from the available material and under the special conditions of each installation. Although not builders of refrigerating machinery, we design refrigerating installations suitable for use in stearic acid and red oil plants, specifying equipment of leading manufacturers.

GARRIGUE FATTY ACIDS DISTILLATION SET  
(Process and Equipment Patented)

*Continued on Next Page*

### CRUDE GLYCERINE AND GLYCERINE FOOTS PLANTS

Garrigue crude glycerine plants have been in successful operation for more than twenty-five years and are the result of careful observation and constant improvement covering that period of time. They practically eliminate loss of glycerine during recovery, and the yield of glycerine from the fats used in the soap kettle should, in good practise, be well above 90% of the glycerine obtainable from raw material, or equal to the practical yield obtained in fat splitting. The chief use of these plants is for the recovery of glycerine from spent soap lyes, from the glycerine waters of fat splitting plants, and from glycerine foots.



GARRIGUE GLYCERINE RECOVERY PLANT (PATENTED)

Any alkali is neutralized with sulphuric or muriatic acid and a compound of iron or aluminum or lime is added as a coagulating agent followed by filtration. In some cases the filtrate is further treated with acid to decompose acetates and similar salts. This feature constitutes our process for the reduction of the organic residue in crude glycerine and the reduction of fatty acids in distillates from crude glycerine.

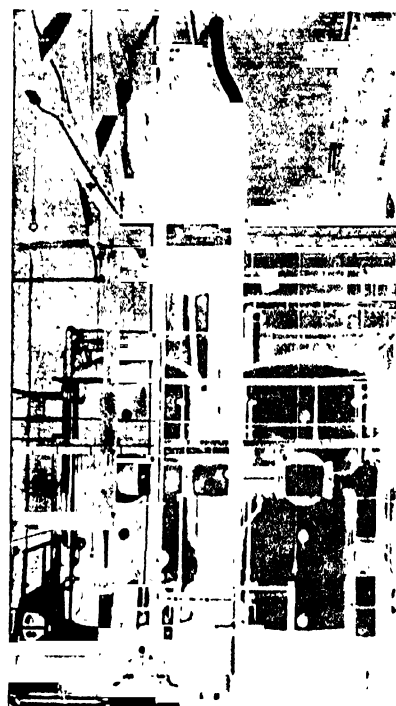
The liquid is next evaporated in vacuum, during which the contained salt crystallizes out and falls into a salt extractor under the evaporator in which it is steamed or washed and from which it is removed for re-use in the soap kettles. This is continued until the evaporator contains a batch of soap lye crude glycerine which is dropped into a settling tank and any remaining acidity neutralized. The cut shows a complete plant of this kind with a small single effect evaporator. It is possible to avoid entirely corrosion of the evaporator and scaling of the tubes.

In the manufacture of half-boiled soap or lime soap for lubricating greases it is desirable to extract the glycerine from the fats directly, for which purpose either of the fat splitting plants described under another heading is used. In that case a glycerine water is settled from the resulting fatty acids which requires a chemical treatment and filtration followed by evaporation.

The chemical treatment varies with the kind of fat used and the purity of "saponification crude glycerine" it is desired to produce. As the liquors contain no salt the evaporator is used without the extractor. Otherwise the plant is as shown.

This grade of glycerine serves many commercial purposes, without distillation, if the liquors are treated accordingly, and also gives chemically pure glycerine in one distillation.

When crude glycerine is distilled, the residue, known as glycerine foots, always retains some glycerine and should be dissolved in water and treated similarly to spent soap lye. In all ordinary cases it pays well to re-work these glycerine foots.



GARRIGUE GLYCERINE RECOVERY PLANT  
SHOWING EVAPORATORS

### GLYCERINE REFINING PLANTS

To produce "Dynamite Glycerine or Chemically pure Glycerine" from crude glycerine, the "double effect" principle and "heat regenerator" principle are made use of by injecting into the still, instead of steam, the vapor from evaporating the weak glycerine water and by superheating this vapor with the hot vapor from the still. The diagrammatic cut below shows these features.

The crude glycerine is heated in the still by means of the steam coil and distils over in an atmosphere of steam issuing from the perforated spider.

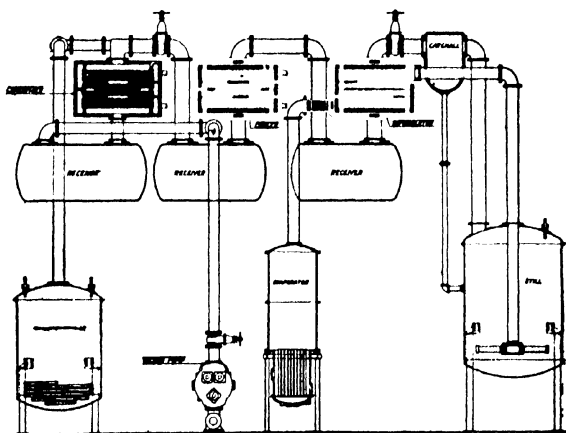
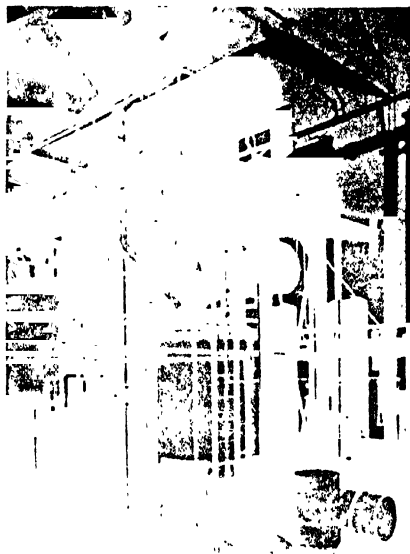


DIAGRAM OF GARRIGUE GLYCERINE REFINING PLANT  
(PATENTED)

*Continued on Next Page*

A catch-all serves to stop entrainment of salt particles. The vapor enters the superheater where most of the glycerine condenses on the copper tubes, giving up its heat to the vapor inside the tubes, and which is on its way to the spider in the still. The condensed glycerine drops into the concentrator. The remainder passes to the "cooler," or first surface condenser.

The tubes in this are supplied with warm water and serve to condense most of the remaining glycerine, which also drops to the concentrator. The temperature of the water is controlled to allow a very little glycerine to enter the final surface condenser along with all the water vapor from the still spider, and also carrying some acetic acid, always present in crude glycerine, which it is necessary to separate from the main distillate in this way.



A GARRIGUE GLYCERINE REFINING INSTALLATION

The final condensation is made complete with cold water in the tubes, and the condensate flows to the "Evaporator," in which it is continually being boiled by means of a coil heated with the exhaust from the still coil. The vapor resulting from this boiling is lead through the superheater to the still spider, and the glycerine carried beyond the cooler is accumulated in the evaporator.

The rate of distillation is controlled by the valve supplying steam to the evaporator coil. The glycerine in the concentrator is maintained at the desired specific gravity by controlling the steam supply to its coil and reading the temperature on an inserted thermometer, the water evaporated passing to the final condenser. If the crude glycerine contains trimethyleneglycol, most of it will have passed into the evaporator; any remaining in the concentrator charge is driven out by superheated water vapor from the spider in the bottom of the concentrator, after the water has been evaporated from the charge. The trimethyleneglycol and glycerine in the evaporator are separated by the usual process of fractionation, for which purpose the evaporator and condenser and receiver are operated as a separate unit. A vacuum is maintained throughout the system by a single pump connected to the receiver under the condenser.

There are no losses inherent in this process, as the temperature cannot get above that of the boiler supplying steam, which is much below glycerine decomposition and the arrangement of the plant makes mechanical loss impossible. In practise, where the residue in the still is properly treated, which is described under "Crude Glycerine" on a preceding page, a full yield of glycerine is obtained. The distilled glycerine is filtered with decolorizing carbon. The entire operation is simple and cheap, and the plant is not subject to any material depreciation. It makes a decided saving of fuel over the older methods

### EVAPORATORS: SINGLE AND MULTIPLE EFFECTS

Our evaporators are of the vertical water tube type and are applicable to a wide variety of liquids, and have special merit for liquids depositing crystals during concentration. They are specially suitable for spent soap lyes. They are made in any number of effects and of different metals suitable to the work.

Mysterious failures to obtain full yields are usually traceable to evaporator losses. We have designed a special catch-all which we consider to be the best device in use for stopping entrainment losses. With the dry system of condensation we elevate the catch-all level with the barometric condenser dropping a barometric column from the catch-all into an open tank where the operator can see if the charge boils over and in which the excess liquid can be held out until the proper conditions are reestablished in the evaporator.

In describing this excellent machine we introduced the subject of safety devices first, because this is the feature we have studied most and about which least is usually said.

Operating on costly materials, we have tried to give the smallest opportunity for frothing or for



GARRIGUE EVAPORATOR SHOWING LOWER PORTION OF CALANDRIA, SALT BOXES AND PUMP

entrainment and then have added means for checking these if they occur. In evaporators for non-crystallizing liquors we introduce the steam in the center of the calandria around the small boiling tubes and baffle it so that it effectually comes in contact with all the heating surface, and we vent the calandria at the outside or coolest part, where there is a row of larger tubes for downward circulation. Thus the direction of the liquid is from the middle to the sides, from a smaller to a larger area, from a hotter to a cooler zone, and the combined area of the down-comers is relatively large in cross section and entirely out of the way of upward gushes, all of which makes for the best circulation.

The vapor space is made wider than the calandria to allow room for the waves of liquid from the center to flatten out and also to make an expansion diaphragm of the upper tube sheet to prevent leakage at the tube ends from expansion strains.

To prevent entrainment there is a conical dash-plate carried on the steam inlet pipe, the outer edge of which is curved down so that any liquor thrown against it is projected to the down-comers.

We have also developed a crystallizing evaporator, the calandria of which is of the basket type. The calandria basket is so located in the body of the evaporator that there is an annular ring between the outside of this basket and the body of the evaporator.

The crystals pass down through this annular ring and (the current at the bottom of the evaporator being inward) they are swept toward the center and pass through a cone into the salt box or receiver.

The current at the bottom of the evaporator being inward sweeps out deposited salts.

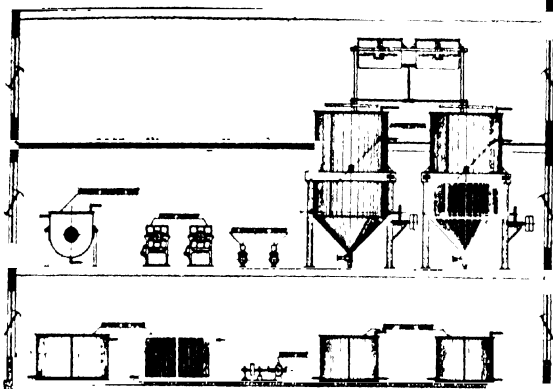
The bottom of the salt extractor has a fine screen on which the crystals rest. When the extractor is filled, as seen through sight glasses, the valve is closed and the adhering liquid blown from the crystals with steam let into the top of the extractor, this liquid returning to the evaporator. In glycerine work the crystals are sometimes washed. The larger machines have two extractors, one of which is always open. The reversible double effects have three extractors, the central one connected to both evaporators. As crystals separate only in the second effect, the arrangement allows two extractors for that effect.

*Continued on Next Page*

### EDIBLE OIL REFINING, BLEACHING AND DEODORIZING

The Garrigue engineering staff has had extensive experience in the installation of refining, bleaching and deodorizing plants for vegetable oils.

Garrigue engineers not only understand the operation of the equipment involved in the processing of oils, but are also thoroughly experienced in the proper methods to be used to handle any particular oil with the least processing loss. The plants are built to meet our customers' particular needs, and equipment is designed and sizes proportioned accordingly. These plants are suitable for cotton-seed, peanut, coconut, corn, soya bean, palm kernel and other vegetable oils.



GARRIGUE OIL REFINING PLANT (PATENTED)

### HYDROGENATION

We design and erect complete plants for hardening (hydrogenating) vegetable and animal oils, including equipment for the generation of hydrogen.

### OLEOMARGARINE AND VEGETABLE MARGARINE PLANTS

We not only design and completely equip factories for the manufacture of butter substitutes, such as oleomargarine and nut margarine, but also place such plants in operation, supplying necessary formulas and instructions on method of processing, should this be desired.

### CAUSTICIZING SODA ASH

The process is applicable in soap works, oil refineries, and wherever caustic lye is used in a fairly dilute state. It pays well to do the causticizing where the lye is used. We are prepared to furnish complete causticizing plants, including a suitable caustic evaporator.

### GARBAGE REDUCTION AND RENDERING

We were the first in this country to build a garbage reduction plant to carry out the process that has out-lived the others for economy, consisting of digesting, pressing, drying, extracting and evaporating the tank water.

This process is sometimes objectionable on account of the difficulty of destroying the odors arising, in which case our revolving extractor provides a complete garbage reduction plant in itself. The same applies to fish rendering.

The material is cooked, grease or oil run off, the residue dried and then extracted. The only outlet is the discharge from the vacuum pump which can be

led to the furnace under the boiler. The operation is particularly attractive to small plants, and provides a very profitable means of disposing of this waste.

### SOAP MANUFACTURE

Our long experience in this field enables us to act in a consulting or advisory capacity in the manufacture of laundry soap, milled toilet soap, transparent soaps, textile or chip laundry soap, soap powders, scouring powders, etc. We are in a position to design and equip complete plants for any of the above.

We have devoted particular attention to the manufacture of soap powder. The Garrigue double roll process, utilizing both water-cooled and brine-cooled rolls, enables the production of light fluffy soap powder in fifteen minutes instead of taking two and a half days, as in the old process. Moreover, the

Garrigue system requires only one handling of the material instead of four, and occupies only one-quarter the floor space.



GARRIGUE SOAP POWDER ROLLS  
(PATENTED)  
Double Roll Process

### SPECIAL APPARATUS

We are equipped to turn out in our own shops the most modern types of stationary or rotary dryers, stills, kettles, autoclaves, digesters, tanks, coils, special equipment, etc. All kinds of special castings for chemical equipment made and machined.

### A FEW REPRESENTATIVE USERS OF GARRIGUE EQUIPMENT

Armour & Company, Chicago, Ill.  
Swift & Company, Chicago, Ill.  
Wilson & Company, Chicago, Ill.  
Andrew Jergens Company, Cincinnati, Ohio  
Lever Brothers, Ltd., Toronto, Ont., Canada  
Los Angeles Soap Company, Los Angeles, Calif.  
The Southern Cotton Oil Company, Savannah, Ga.  
United States Glue Company, Milwaukee, Wis.  
Peet Bros. Mfg. Company, West Berkeley, Cal.  
B. T. Babbitt, Inc., Babbitt, N. J.  
Citrus Soap Company, San Diego, Cal.  
Cape Explosives Works, Ltd., Cape Town, So. Africa  
Compania Comercial de Fomento de Cuba, Cardenas, Cuba  
Alfonso Ansoleaga y Hno., Mexico City, Mexico  
Mitsui & Company, Yokohama, Japan  
Other names in your section on request

### INQUIRIES SOLICITED

We are always glad to send drawings and descriptions of our plants and processes, and information to prospective users regarding yields and costs.

Inquiries for Export Trade will always have most careful attention. We have built plants for erection in many parts of the world and are especially well equipped to handle this class of business.

# GENERAL BAKELITE COMPANY

2 RECTOR STREET, NEW YORK, N. Y.

WORKS: PERTH AMBOY, N. J.

## BAKELITE

Reg. U.S. Pat. Off.

### PRODUCT

**Bakelite**—A synthetic condensation product of carbolic acid and formaldehyde.

### BAKELITE

The product Bakelite results from a patented process in which carbolic acid and formaldehyde react to form a synthetic resin-like material. The raw Bakelite is both soluble and fusible, but has the unique property of becoming insoluble, infusible and very hard, strong and resistant after being subjected to heat.

Bakelite is manufactured and furnished to the trade in the following forms:

### BAKELITE MOLDING MATERIAL

A plastic material in powder or sheet form for hot hydraulic press molding. Must be molded in steel dies under pressure of approximately 2000 lb. per square inch, at a temperature of 350° F. Average molding time, 6 to 12 minutes.

### BAKELITE VARNISH

A coating and impregnating material for electrical coils, windings and insulation. Highly dielectric and heat resisting. Impervious to oils, water, solvents, and most chemicals. Hardened by baking.

### BAKELITE ENAMEL

An opaque coating to protect metal surfaces against corrosion and the action of chemicals. Effective as an insulating covering for metal parts on account of its dielectric strength, hardness and resistance to heat. Baked, after application, at 250° F. for 2 hours.

### BAKELITE LACQUER

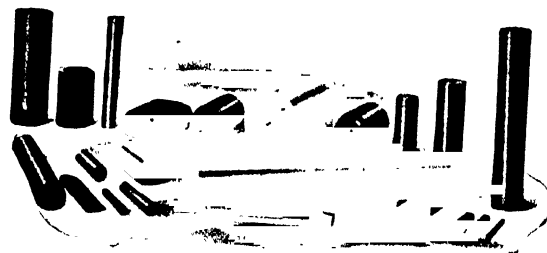
A hard, transparent coating for highly finished metal. Resists solvents, gases, water and perspiration. Baked, after application, at 275° F. for 20 minutes.

### BAKELITE CEMENT

A technical cement for bonding glass, metal, porcelain, etc. Extremely hard and tenacious; exceptionally resistant to heat, solvents and most chemicals. Requires baking after application.

### BAKELITE, CLEAR, TRANSLUCENT AND COLORED

A transparent or translucent material, of amber or other color, used for pipe stems and cigar holders; fancy fountain pens, buttons, handles; jewelry and other novelty goods. Odorless, tasteless and non-inflammable.



EXAMPLES OF BAKELITE SHEET, ROD, AND TUBE

### BAKELITE SHEET, ROD AND TUBE

A laminated product manufactured from certain grades of paper and fabric processed with Bakelite. Characterized by unusual strength, resiliency and toughness. Possesses high dielectric strength. Exceptionally resistant to heat, oil, water and most chemicals. Will not warp or deteriorate with age. Can be machined and punched.

Used for a wide range of electrical and mechanical applications requiring maximum strength, high insulating quality and heat resistance.

### BAKELITE, MOLDED

A finished product molded accurately to dimension with a clear sharp finish from the die; metal inserts can be molded exactly in place. Combines great dielectric and mechanical strength, with high heat resistance. Can be machined and polished. Is non-hygroscopic, impervious to water, steam, oils and solvents and is chemically inert. Does not bloom, change color or deteriorate with age. Used for electrical insulators and mechanical parts.



EXAMPLE OF MOLDED BAKELITE

### BAKELITE SPECIAL MATERIALS

A research laboratory is maintained by the General Bakelite Company for the working out of special applications of Bakelite in its various forms.

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# GENERAL OIL GAS CORPORATION

511 Fifth Avenue

NEW YORK, N. Y.

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## PRODUCT

**The Dayton Process Apparatus for the manufacture of Oil Gas.**

## THE DAYTON PROCESS

The Dayton Process solves the problem confronting the manufacturer for whom constantly increasing coal or fuel oil bills, or the ever-decreasing supply of natural gas have become questions of vital importance.

The Dayton Process apparatus affords a means of generating a cheap gas, with low investment charges, and a substitute for direct firing of fuel oil which will effect large savings in total fuel consumption.

Its operation is simple and automatic and requires **less than one-third the operating labor** of any other producer.

It is remarkably compact, and produces a gas suitable for all purposes.

Dayton Gas can be burned in equipment designed for standard illuminating gas or natural gas with minor adjustment.

It is particularly adaptable to uses that require a clean, sulphur free, uniform gas and high flame temperatures without regeneration.

As an auxiliary equipment to supplement natural gas without change of equipment it is without equal.

## OUTSTANDING FEATURES OF THE PROCESS

The principal points of difference between the Dayton process and other types of artificial gas generators are as follows:

1. The process herein described is independent of intermittent and external heating.
2. The process is automatic, continuous, and self-sustaining.
3. The B.t.u. value desired can be selected, and when the apparatus is once adjusted this heat content is automatically maintained without variation.
4. The only raw material necessary for the production of 1000 cu. ft. of 450 to 500 B.t.u. gas is 4.0 gal. of residuum or fuel oil.
5. The gas produced is clean and free from sulfur, thus requiring no purification, regardless of the sulfur content of the oil used.
6. The equipment is compact and requires little floor space. A plant with a capacity of 1,000,000 cu. ft. per day of 450 to 500 B.t.u. gas can be housed in a room 30 ft. x 50 ft.
7. No gas storage is required, the gas-making being automatically regulated by the demand.
8. The labor requirements are but one man per shift for a plant of 1,000,000 cu. ft. capacity per day.
9. After a complete shutdown for 24 hrs. or longer, the equipment can be brought to capacity in less than 0.75 hr.

**WRITE US FOR FURTHER INFORMATION**

# GENERAL CERAMICS COMPANY

Manufacturers of Acid Proof Stoneware

Main Office: 50 Church Street, NEW YORK, N. Y.

WORKS: KEASBEY, N. J.

## PRODUCTS

A Complete Line of Acid Proof Chemical Stoneware including:

Acid Elevators—auto-matic and non-auto-matic	Nitrating Vessels
Carboy Stoppers	Percolators
Check Valves	Photographic Tanks
Chlorine Generators	Pipes of all Kinds
Coils	Pots
Crystallizing Vessels	Pumps—Plunger and Centrifugal
Dampers	Pumps for gases
Decanting Pots	Receivers
Dipping Baskets	Retorts
Exhausters	Safety Valves
Faucets of all Kinds	Stills
Filters	Stirrers
Foot Valves	Storage Vessels
Funnels	Subliming Dishes
Injectors	Suction Filters
Jars	Siphons
Kettles	Tanks
Laboratory Sinks	Tourills
Lanterns	Towers
Mariotte Bottles	Vacuum Kettles
Mortars	Valves
	Vats

We design and install complete plants ready for operation, for the manufacture, recovery and storage of acids and other corrosive products.

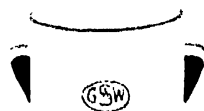
Our Chemical Engineering Department is at your service for estimates and full particulars.

## POTS

Capacity of 6 gallons to 265 gallons. Can be furnished with covers, and with or without bottom outlet.



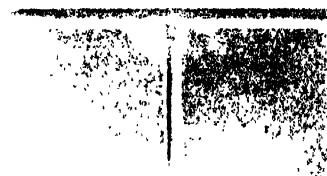
ACID PITCHER



CYLINDRICAL ACID POT  
With Ball Handles

## RECTANGULAR TANKS

Made in capacities from 4 gallons up to 1,000 gallons and up to 11' 6" long.



## STORAGE VESSELS

Capacities, 130 gallons to 1,050 gallons. Furnished with or without bottom outlet.

## CYLINDRICAL VESSELS

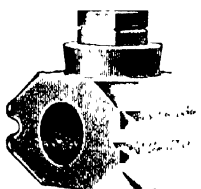
Capacities, 14 gallons to 1,125 gallons. Can be furnished with covers, and with or without bottom outlet.



## FAUCETS

Below we illustrate a few styles of the great variety of faucets we manufacture.

Sizes 3/8" to 4" inside dia. Larger sizes to order.

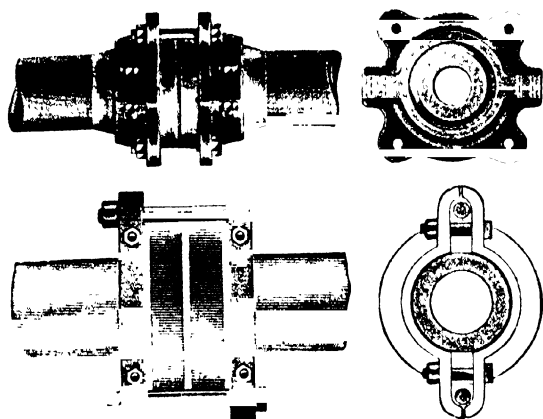


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**PIPES**

Flanged pipe can be furnished in all diameters up to 6". Larger pipes to special order.

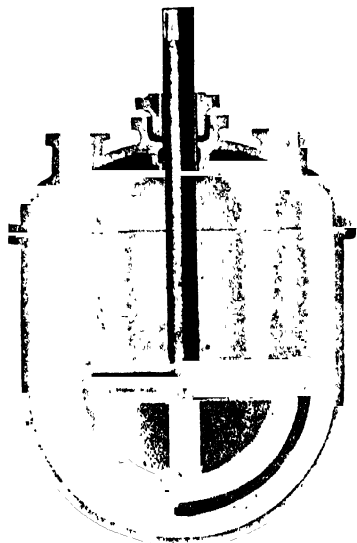


Socket pipe can be furnished in any diameter up to 48"

All styles of pipe can be furnished complete with elbows, tees, Y's, faucets, and other fittings

**STILLS AND KETTLES**

Made in all capacities up to 165 gals. Can be furnished complete with ground on air tight covers and stirrers as illustrated

**SUCTION FILTERS**

Made in a variety of sizes from 1/2 gal. for laboratory purposes, to 90 gal. for industrial purposes. In the larger sizes the sieve plates are arched on the under-side and will safely resist the pressure due to a complete vacuum.

**EVAPORATING DISHES****Shallow:**

Capacities  
from 1 1/4 gal  
up to 42 gal

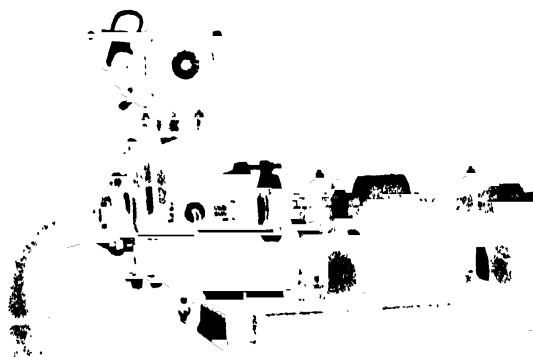
**Hemispherical:**

Capacities  
8 1/2 gal up  
to 120 gal

**PUMPS**

Plunger pumps are furnished in capacities from 7 gallons per minute to 85 gallons per minute

Centrifugal pumps are made in two sizes in capacities up to 350 gallons per minute

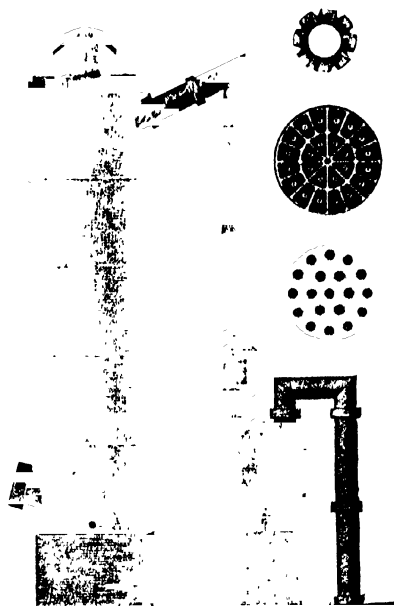


CENTRIFUGAL PUMP

**TOWERS**

In standard sizes, also special types such as the Kypke Star Plate Tower and the well-known Lunge Plate Tower

For the absorption and condensation of gases, in connection with the manufacture of muriatic, nitric, sulphurous acids, etc., nitric acid recovery plants, gas drying plants and installations for handling waste gases. We are prepared to furnish and install complete equipments for the above purposes.

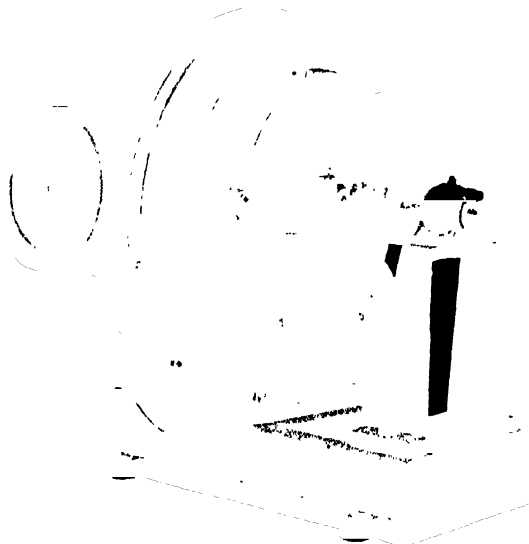


TOWER INSTALLATION

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**EXHAUSTERS**

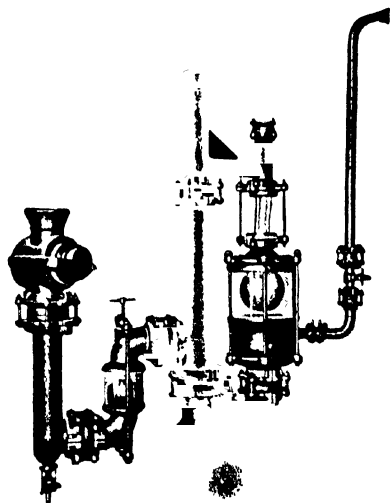
For acid gases, made in four sizes for 4", 6", 8" and 12" gas connections: so designed that chemical stoneware alone comes in contact with the gas. These machines are encased in an iron shell.

**ACID ELEVATORS, NON-AUTOMATIC**

These acid elevators or Montejus or blow-cases are furnished in capacities from 15 gallons to 525 gallons. They can be furnished, if desired, completely encased in a cast-iron shell for use against heavy pressure.

**AUTOMATIC ACID ELEVATORS**

The Plath automatic acid elevator is furnished in three sizes, having capacities of 530, 1,060 and 1,600 gallons per hour, respectively. The Securius pattern is made in two sizes having capacities of 260 and 530 gallons per hour, respectively. Either type is suitable for elevating any corrosive solution and requires no attention beyond a constant supply of compressed air.



PLATH AUTOMATIC ACID ELEVATOR

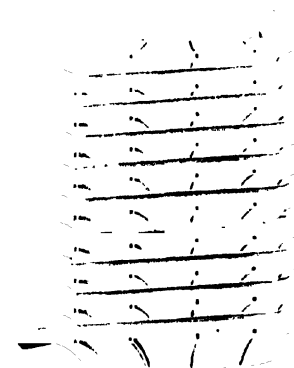
**INJECTORS**

For moving liquids by means of steam, or gases by means of steam or compressed air.

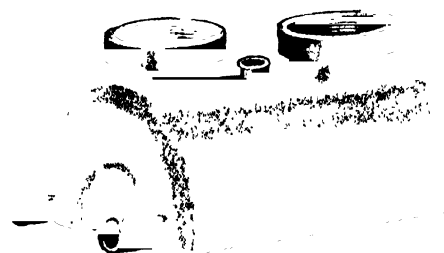
**COILS**

Made in a large variety of sizes from 3/8" to 3" bore and 17' 0" to 90' 0" length of tube.

For condensation of nitric acid and distillation and rectification of organic acids under vacuum or normal pressure. Also made with raised outlet for heating and cooling liquids.

**CELLARIUS TOURILLS**

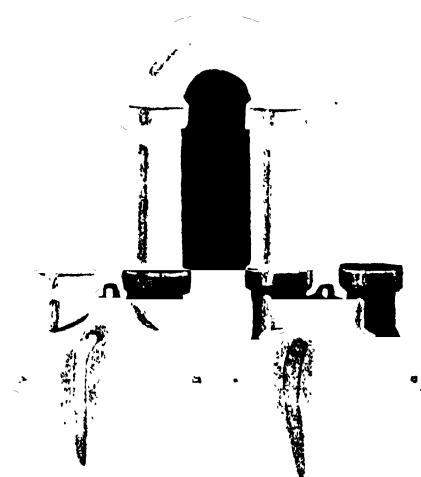
Made in three sizes for 6", 8" and 12" gas connections for muriatic acid.

**TOURILLS (RECEIVERS) FOR CONDENSATION OF NITRIC ACID**

6 gal. to 150 gal. capacity.

Also to special design for condensation under vacuum.

These vessels can be furnished with dip pipe to serve as Woulff's bottles, and with overflow tubes for the manufacture of muriatic acid.



*Continued on Next Page*

**ACID AND TEMPERATURE RESISTING PURE FUSED SILICA**

Fused Silica is produced by our own process covered by our own patents. It is made in various finishes such as opaque, smooth inside, and rough sandy finish outside, glazed, semi-transparent, smooth inside and outside and absolutely transparent. The latter grade represents the latest development in the fusing of Silica.

A Complete Line for the Laboratory and for Plant Equipment.



**BEAKERS**, (glazed) from 50 cc. to 800 cc.

**CAPSULES**, circular or rectangular, from 7 cc. to 75 cc.

**CASCADE PLANT** for the Concentration of Sulphuric Acid.

**CASSEROLES**, from 30 cc. to 350 cc.

**COMBUSTION BOATS**, from 1 3/4" to 6" in length.

**COMBUSTION TUBES**, glazed or unglazed, plain ends, closed, reduced end, or with transparent section.

**COILS**, from 1/8" to 2" bore, in lengths up to 60 feet.

**CONCENTRATION DISHES**, in standard sizes

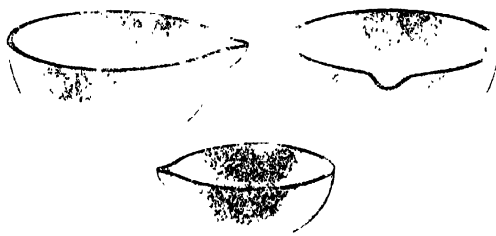
**CONDENSING APPARATUS**, to special design

**CRUCIBLES**, glazed or unglazed, standard or special sizes, from 10 cc. up to 22500 cc.



CRUCIBLES

**DISHES**, glazed or unglazed, flat or deep shape, from 20 cc. up to 22500 cc.



DISHES

**FLASKS**, semi-transparent, from 50 cc. up to 1000 cc.

**GLOVE TOWER LIPS AND GUTTERS**, standard.

**GOOCH CRUCIBLES**.

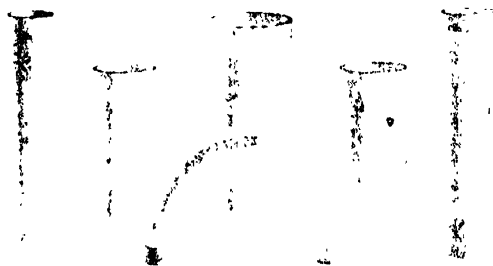
**MUFFLES**, rectangular, curved sides or straight sides, with curved top.

**PIPES**, Fused Silica Pipes are made either with plain ends or with sockets.

They are practically indispensable for installations where stoneware piping cannot be used because of the high temperature of the liquid or gas. The inner surface of the pipes is smooth.

Special sizes and shapes are made to customers' drawing.

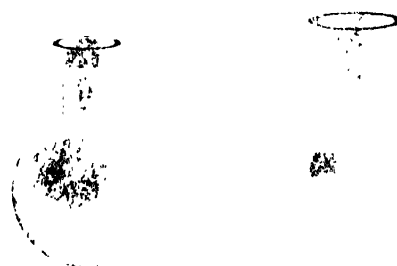
Straight, plain ends or socketed, taper shape, from 1/32" to 18" bore.



PIPES

**PLATES**, opaque, glazed or semi-transparent.

**RETORTS**, up to 75 litres capacity.



RETORTS

**RODS**, up to 6 feet in length.

**S-BENDS**, up to 9" bore and 78" length.

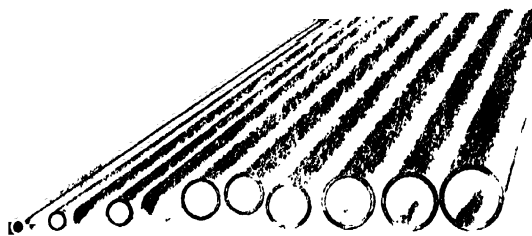
**STILLS**, made to special design.

**TANKS**, up to 10 gallons capacity.

**TRAYS**, four-sided or three-sided, up to 16 3/4" in length.

**TRIANGLES**, all silica, nickel or nichrome.

**TUBES**, Fused Silica Tubes are recognized to be superior either to glass, porcelain or platinum, especially in combustion work. The tubes may be had either with thin or heavy walls. They are furnished with ends fused smooth and round, for rubber stopper, glazed, unglazed, up to 4 1/2" bore, in lengths up to 10 feet.



TUBES

**SPECIAL APPARATUS MADE TO CUSTOMERS' OWN DRAWINGS. ASK FOR OUR CATALOG NO. 4.**

# GENERAL ELECTRIC COMPANY

## GENERAL OFFICE: SCHENECTADY, N. Y.

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Washington, Seattle  
Washington, Spokane  
Washington, Tacoma  
West Virginia, Bluefield  
West Virginia, Charleston  
Wisconsin, Milwaukee

\*Southwest General Electric Co.

DISTRIBUTOR FOR GENERAL ELECTRIC COMPANY OUTSIDE OF THE UNITED STATES

### INTERNATIONAL GENERAL ELECTRIC CO., INC.

GENERAL SALES OFFICES: 120 Broadway, New York; Schenectady, N. Y.

### FOREIGN REPRESENTATIVES

Argentina: General Electric, S. A., Buenos Aires  
Australia: Australian General Electric Co., Ltd., Sydney and Melbourne  
Belgium and Colonies: Societe d'Electricite et de Mecanique Procedes Thomson Houston & Carrel, Societe Anonyme, Brussels  
Bolivia: International Machinery Co., La Paz and Oruro  
Brazil: General Electric, S. A., Rio de Janeiro and Sao Paulo  
Canada: Canadian General Electric Co., Ltd., Toronto  
Chile: International Machinery Company, Santiago, Antofagasta and Valparaiso  
China: Anderson, Meyer & Company, Ltd., Shanghai, International General Electric Co., Inc. (General representatives of the Far East, excluding China and Japan), Shanghai  
Colombia: Wesselhoft & Poor, Medellin, Barranquilla and Bogota  
Cuba: General Electric Company of Cuba, Havana and Santiago  
Dutch East Indies: International General Electric Co., Inc., Soerabaya, Java  
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Egypt: British Thomson Houston Co., Ltd., Cairo  
France and Colonies: Compagnie Francaise Thomson Houston, Paris  
Great Britain and Ireland: British Thomson Houston Co., Ltd., Rugby, International General Electric Co., Inc., London  
Greece and Colonies: Compagnie Francaise Thomson Houston, Paris, France

India: British Thomson Houston Co., Ltd., Calcutta and Bombay, International General Electric Company, Inc., Calcutta  
Italy and Colonies: Franco Tosi Societa Anonima, Milan  
Japan: International General Electric Co., Inc., Yokohama, Shibaura Engineering Works, Tokyo, Tokyo Electric Co., Ltd., Kawasaki  
Mexico: Mexican General Electric Co., City of Mexico and Guadalajara  
New Zealand: National Electrical & Engineering Co., Ltd., Auckland, Dunedin, Christchurch, and Wellington  
Paraguay: General Electric, S. A., Buenos Aires, Argentina  
Peru: W. R. Grace & Co., Lima  
Philippine Islands: Pacific Commercial Company, Manila  
Porto Rico: International General Electric Co., Inc., San Juan  
Portugal and Colonies: Sociedad Iberica de Construcciones Electricas, Madrid, Spain  
Russia: Wsebshtchala Electricheskaya Kompaniya, Petrograd and Vladivostok  
South Africa: South African General Electric Co., Ltd., Johannesburg and Cape Town  
Spain and Colonies: Sociedad Iberica de Construcciones Electricas, Madrid, Spain  
Uruguay: General Electric, S. A., Montevideo  
Venezuela: Wesselhoft & Poor, Caracas

### PRODUCTS

The General Electric Company manufactures complete electrical equipment for industrial chemical plants.

The fabrication of this immense line of electrical machinery and supplies is carried on in a number of plants equipped with every feature tending toward quality manufacture and prompt delivery.

Many industrial plants standardize on G-E equipment, because of the advantage of having all electrical equipment built by one company and assembled ready for operation.

So general is the use of electrical equipment in the modern industrial chemical plant that it is hardly an exaggeration to say that the present day development of these industries can be attributed to the high development of electrical machinery as much as to any one other factor. The General Electric Company has contributed largely to this development by producing equipment for generating and distributing the necessary electrical energy; motors and control for utilizing that power; special equipment for electrothermal and electrolytic applications; and still other electrical apparatus for industrial lighting.

In these pages it is attempted to give a very condensed survey of the electrical products which the Company has to offer the chemical engineer. These descriptions are grouped by general divisions as follows:

G-E Laboratory Service.....	Page 509
Electro-Chemical Plant Equipment ..	510
Electro-Thermal Applications.....	511
Applications for Motor Drive.....	513
Miscellaneous G-E Products.....	515



### SERVICE TO CHEMICAL INDUSTRIES

It should be remembered that no list or display of G-E products is necessarily complete as the Company is constantly developing new machinery, devices and materials. Consequently, it is always advisable when contemplating the erection of new plants or additions in which electrical equipment is used, to get in touch with the Company's General Office or nearest Branch Office.

G-E specialists are prepared to assist those in charge of the design, erection or operation of industrial chemical plants and to select the most suitable electrical equipment. They invite the opportunity to cooperate with chemical plant engineers.

Other manufacturers receive cordial cooperation from the General Electric Company in developing the electrical features of their machinery, which can readily be obtained with G-E products incorporated by specifying "G-E" when the machinery is purchased.

### WHERE TO GET G-E PRODUCTS

Contact with users of G-E equipment is maintained through sales offices, listed above, which embrace the whole country. G-E Distributing Jobbers are located in all large cities, and warehouses, conveniently placed, insure prompt delivery of orders from sales offices or jobber.

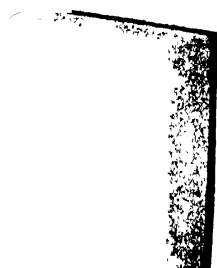
G-E motor dealers, whose stores are headquarters for standard motors and motor repair service, are located in every city and large town. Electrical supply stores sell G-E merchandise products—small electrical devices, usually packaged.

Continued on Next Page

**G-E DESCRIPTIVE PUBLICATIONS**

To assist in the proper selection, operation and maintenance of G-E equipment and supplies many publications are available.

The General Catalogue, issued annually and distributed to users of G-E equipment, gives descriptions and data on practically all G-E products, and, in some cases, identification for ordering. Special bulletins and booklets give more detailed information on many subjects. Bulletins describing some of the many G-E products having application in industrial chemical plants are referred to on the following pages and are readily obtainable upon request from G-E Sales Offices. In requesting bulletins, promptness in reply will be facilitated by referring to bulletin number.



**G-E ANNUAL CATALOGUE OF 1300 PAGES DISTRIBUTED TO PURCHASERS OF G-E EQUIPMENT**

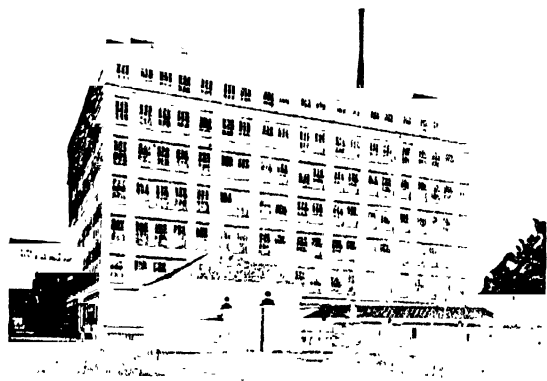
To insure proper assembly and operation of equipment, special information in the form of instruction books and cards, drawings and connection diagrams accompanies shipment. Additional copies of these are gladly furnished whenever required.

**Renewal Parts Catalogues** covering industrial equipment, make it easy to order renewal parts and thus maintain equipment with supplies made by the original manufacturer. Each catalogue contains views of the component devices, giving accurately the name of individual parts and the proper ordering numbers.

G-E supply parts bulletins are also available, which enable the user to specify parts accurately and quickly.

**G-E RESEARCH FACILITIES**

The General Electric Company's research laboratories are known to the scientific public throughout the world as among the most extensive and best-equipped institutions of their kind. In these laboratories new products are constantly being produced which eventually find their way into commerce, instituting im-



**THE G-E RESEARCH LABORATORY AT SCHENECTADY, N. Y.**

portant improvements and opening up new lines of industry.

Much of this research would seem to be only remotely related to the activities of the Company but much effort is devoted each year to investigation in theoretical physics, chemistry and engineering. It is only by carrying on a great amount of this work that new developments can be achieved.

Here are mentioned a few products which have been developed as a result of research and which are offered for sale as they may prove of value. In addition there are a number of special products desirable mainly for experimental use, such as pure argon gas, metallic calcium, silicon tetrachloride, and titanium tetrachloride. For further information write the Supply Department, General Electric Co., Schenectady, N. Y.

**A Suggestion to Investigators**—The G-E research laboratory, because of the variety of its work, frequently has occasion to make up materials not otherwise readily obtainable and to investigate their properties. Although the Laboratory would willingly in most cases give others the benefit of its experience, the results often are not of sufficiently general interest to warrant publication.

It is, therefore, suggested that any worker in science who needs and does not know where to obtain some special material or information, write to the G-E Research Laboratory. If it is available, either information or material will be gladly supplied. If not, as may often happen, the Laboratory may be able to suggest where it can be obtained or how produced. Such inquiries should be addressed to the Company's Research Laboratory, Schenectady, N. Y.

**The Arsem Vacuum Furnace** for obtaining very high temperatures, comprises a heater enclosed in a vacuum chamber, the heater being of such shape that it almost entirely encloses the article to be treated, but is provided with windows for observing behavior of contents. Two types are made—a vertical type and a box type. (Bulletin 49711.)

The following uses may be mentioned:

Preparation of metals, alloys and various compounds.  
Determination of melting points by an optical pyrometer or by reference to the furnace calibration curves.  
Calibration of optical pyrometer.  
Distillation of refractory substances for separation or purification.  
Study of equilibrium in the reaction depending upon the pressure of the gaseous phase.

**Vacuum Pumps**—The Langmuir condensation pump is an improved form of pump for obtaining very high vacua. With this pump there is no definite lower limit (other than zero) below which the pressure cannot be reduced. Pressures as low as  $10^{-4}$  bars can be obtained. It is designed for high speed (3000 and 4000 c.c. per second).

Also a two-stage rotary oil vacuum pump, developed primarily as a rough or backing-up pump to be used with the Langmuir condensation pump. It can be supplied with or without the latter or without motor. With this pump driven by motor, a pressure of .001 mm. of mercury can be obtained.

**Kenotron**—A rectifier for obtaining very high voltage; direct current, which is found valuable for producing current for spectroscopy work, operating small discharge tubes, cable testing, and for electrical precipitation of fumes and smoke. It is used in connection with the Cottrell process mentioned on page 517.

Kenotrons can be supplied in four standard sizes rated as follows:

100,000 volt, 100 milliamperes, 100,000 volt, 250 milliamperes, 20,000 volt, 100 milliamperes, and 10,000 volt, 100 milliamperes.

**Boron Carbide**, or Boroflux as it is known, is a deoxidizer used in casting mechanically sound copper castings of high electrical conductivity. By the use of this flux, under ordinary foundry conditions, a conductivity of 85% or better is readily obtained. Under careful conditions, this will be 90 to 95%.

**Genelite** is a synthetic bronze containing approximately 40% by volume of graphite distributed evenly throughout its mass. This metal for light-duty bearing purposes, may be used without additional lubrication, and also



**KENOTRON**

*Continued on Next Page*

has unusual qualities when operated for heavier duty with lubrication.

**Water Japan** is a non-inflammable japan, water taking the place of the usual inflammable solvent and, therefore, all fire risk is eliminated by using this material.

It is used in practically the same manner as ordinary japans except that the parts to be treated are preheated before they are dipped, afterward being baked in the same manner as the ordinary japan.

### ELECTROCHEMICAL INDUSTRIES

The development of electrochemical industries is a matter of great interest and of grave concern not merely to chemists and engineers but to every inhabitant of this country, for upon these industries may well depend not merely our prosperity but, at no very distant date, our very existence as a nation. The products of these industries are indispensable in almost every branch of our industrial life, and, moreover, during the recent war, it was clearly demonstrated how vitally important are some of the products of electrochemical industry. These products include such essential materials of construction as aluminum, the purer forms of copper, zinc, nickel and lead; the ferro alloys without which we could have no special steels; such essential manufacturing aids as abrasives and refractories; essential chemicals such as the alkali caustics, chlorates, perchlorates, cyanides, chlorine and bleaching powder, phosphorus, etc.; nitrogenous fertilizers; nitrates and other chemical products essential for military purposes.

In the electrochemical industries electric power is used in three general classes of service:

- (1) For the production of high temperatures in electric furnaces (thermal applications).
- (2) For purely mechanical purposes, viz., the driving of various machines, such as pumps, blowers, and mills by means of electric motors.
- (3) For the production of electrolytic effects.

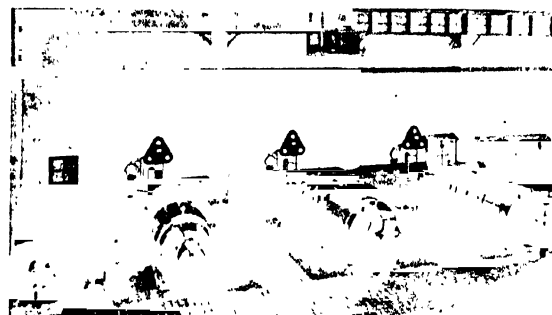
The electric generating, distributing and controlling equipment for the last of these classes of service—the electrolytic—is described briefly here, the two other classes of service being considered on the pages following.

The electrolytic plants of this country use relatively large quantities of electric power. The lowest power consumptions per ton of product, those involved in the refining of metals by electrolytic transfer through solution from anode to cathode, range from 200 to 400 kw-hr. Nevertheless, by reason of the very large scale on which these operations are conducted, power is consumed in this specific service equivalent to a continuous load approximating 100,000 kw. For the production of metals from solution, using insoluble anodes, the power consumption per ton of product is many times greater, ranging from 2000 to 3000 kw-hr. for copper and nickel, and from 3000 to 4000 kw-hr. for zinc. In spite of the fact that this branch of electrochemical work is of very recent development, it involves an installed load capacity exceeding 75,000 kw. For the production of metals by electrolysis of their fused salts, again using insoluble anodes, the power consumptions per ton of product range from 200 kw-hr. in the case of lead to 25,000 or 30,000 kw-hr. in the case of aluminum. The aluminum thus produced in America in 1918 involved a power consumption equivalent to a continuous load of 100,000 kw. The elec-

trolysis of brine, for the production of caustic and chlorine, and the miscellaneous electrolytic oxidation and reduction operations involve a power consumption which is probably equivalent to a continuous load approaching 60,000 kw.

In all of the above mentioned industries, the cost of power is a major item, and often a controlling item in the cost of production. Chemical engineers, not experienced in the design of electrical equipment, may not immediately appreciate the fact that along with their development of process equipment, there has had to be a corresponding development of electrical equipment by electrical engineers, in order that electric power might be available at a cost such that the electrochemical process could be commercially feasible.

Throughout this development the General Electric Company has played an important part; its engineers and specialists have studied these industries since their earliest beginnings, and they have collected experience and data which have enabled them to design and construct machinery capable of meeting all of the electrical requirements of the electrochemical plant.



G-E TURBINE GENERATORS SUPPLYING POWER TO ELECTRO-CHEMICAL PLANT

**Generator Installations**—Low cost of electric power is essential for the successful commercial development of many electrochemical products. A few years ago, water-power was the principal source of cheap electrical energy, but the recent remarkable increase in efficiency of steam-electric generators, particularly steam turbine-driven units, frequently enables the steam plant to successfully compete with the hydro-electric plant.

Steam turbines and electrical equipment for steam, gas, oil engine, or hydro-electric generating stations, and for transmission systems and substations can be furnished complete by the General Electric Company. Specific inquiries on any of these subjects are invited by G-E specialists. The General Electric Company has manufactured and installed electrical apparatus, which is operating successfully at voltages as high as 165,000 volts and G-E equipment is now being built to operate at 220,000 volts. More than 3,000,000 kv-a. capacity of water-wheel type generators; more than 10,000,000 kw. capacity of steam turbine-driven generators, and many millions of kv-a. in transformer capacity have been built by the General Electric Company, and placed in successful operation. Bulletins descriptive of this apparatus will be supplied upon request.

**Synchronous Converters**—Synchronous converters are extensively used in the electrochemical industry. They can be provided with direct-connected alternating-current boosters, by means of which the direct-current voltage may be varied 15% to 20% in either direction from the average direct-



TRANSFORMER INSTALLATION

*Continued on Next Page*

current voltage. They can be supplied for nearly all voltages employed in industrial plants. In small installations direct-current voltages of 250 volts or less are usually employed, but in large installations direct-current voltages as high as 600 volts are used.

Commercial uses of synchronous converters in the electrochemical industries require that they supply current continuously for long periods of time and must be thoroughly reliable and of high efficiency. The General Electric Company has furnished for each service some of the largest units ever built.

Standard machines with high current capacity are listed in the table below; also smaller units for converting small amounts of power from alternating to direct current. For further information send for Bulletin 42500.

#### CONVERTERS FOR INDUSTRIAL SERVICE, 250 VOLTS

Freq.	Poles	Kw *	R P M	Amps	Approx. Shipping Weight Lbs.
25	4	550	750	2200	21500
25	4	850	750	3400	30500
25	6	1100	500	4400	13000
25	8	1750	375	7000	72000
25	10	2250	300	9000	92000
60	6	550	1200	2200	16000
60	8	850	900	3400	23000
60	8	1000	900	4000	24000
60	10	1250	720	5000	31500
60	12	1750	514	7000	55000
60	16	2250	450	9000	63000

\* Larger converters can be furnished on request.

Freq.	Amp	Kw	R P M	Volts	Approx. Shipping Weight Lbs.
60	300	30	1800	125	3000
60	300	30	1800	250	2950
60	600	60	1800	125	3850
60	300	60	1800	250	3750
60	800	90	1200	125	4700
60	600	90	1800	250	4600
60	110	1200	1200		4000
60	165	1200	1200		4250
60	220	1200	1200		5600
60	330	1200	1200		7600



FOUR 8825-KW. G-E SYNCHRONOUS CONVERTERS

Each of these machines supplies 13000 amperes at 525 volts for the electrolytic production of aluminum.

**Variation of Voltage**—In those electrochemical processes requiring a greater range of voltage than can be obtained from the booster type of synchronous converter, and where momentary interruption of the circuit is not objectionable, the transformer may be furnished with various taps for connection to the converter through proper switching equipment. There are very few electrolytic or electrochemical processes, however, which require a voltage variation sufficient to warrant the installation of such an equipment.

**Motor-Generator Sets**—Where large and rapid variations are required without interruption to the circuit, motor-generator sets are preferable to the synchronous converter. Also, if disturbances, or great voltage fluctuations are apt to occur in the power supply circuit, the motor generator set is preferable to the synchronous converter.

G-E motor-generator sets can be furnished with or without direct connected exciters, and with either induction or synchronous motors. When equipped with synchronous motors, the motor may be used in power factor correction.

#### SYNCHRONOUS MOTOR-GENERATOR SETS—60 CYCLES

Capacity kw	Speed R P M	Voltages		Shipping Wt. Approx. Lbs.
		d c	a c	
125* Intermediate sizes standard up to 625	1200	125 volts	2300	8200
	514	125	2300	48000
125 Intermediate sizes standard up to 1800	1200	250/275	440-550-2300-4000	7800
	500	250/275	2300-1000	88000

\* Information on sets of lower capacity furnished on request.



TWO G-E 200-KW. MOTOR-GENERATOR SETS IN NITRATE PLANT

All sets may be arranged for starting from either the direct-current or the alternating-current end. (Bulletin 42552A.)

**Control Equipment**—In electrolytic plants employing direct-current circuits of high amperage and low voltage, special and carefully designed control, starting and circuit-breaking equipment is required. The jumping distance of these low voltages is small, and great reliance can be placed on insulation, but such a circuit will feed a great deal of energy into an arc once established. Consequently, switches and circuit breakers for use in electrolytic plants should be especially designed and carefully chosen.

The General Electric Company manufactures a complete line of circuit breakers and switches and remote control equipment suitable for use in electrochemical plants. For description of high-current capacity air circuit breakers for this service send for Bulletin 47540.

For high-voltage circuits and for alternating current as employed in the operation of plants manufacturing abrasives, graphite, ferro-alloy, calcium carbide, etc., a complete line of G-E overload and remote control equipment is also available.



20,000-AMPERE, D.C. SINGLE-POLE, AUTOMATIC AIR CIRCUIT BREAKER BUILT FOR ALUMINUM COMPANY OF AMERICA

#### ELECTRO-THERMAL APPLICATIONS

The General Electric Company is constantly developing new types of equipment, necessitated by the rapid advance in the utilization of electric heat in industrial operations. It offers the chemical industry a varied line of electrical heating apparatus, which is being successfully applied in many different processes. Chemical engineers designing installations in which electric heating equipment can be used should avail themselves of accumulated knowledge and experience in this line.

The following are a few of the numerous operations

*Continued on Next Page*

which have been simplified or improved by the adoption of electric heating with automatic temperature control:

Drying chemicals, salts, pharmaceutical products, molded metals, abrasives, dyestuffs, inks, paper and wood and food products.

Baking japans, paints, varnishes, core compounds, lacquers and other metal coating.

Melting compounds, pitch and wax, and heating oils and solutions, melting lead, tin, solder and babbitt, melting brass, copper, aluminum, zinc and non-ferrous alloys.

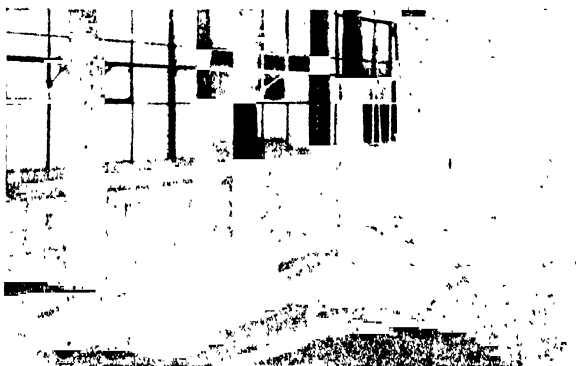
Hardening, drawing, annealing and tempering carbon steels, drawing high speed steels, annealing brass, copper and nickel, annealing glass. Firing vitreous enamel.

Shardizing (rust proofing) various metal parts.

**Arc Furnace Equipment**—This Company can supply all electrical equipment needed in connection with the operation and control of any type of electric arc furnace. (Bulletin 48710A.)

Designers of furnaces for reduction of ores, for production of abrasives, ferro-alloys, steel, electrolysis of fused salts, fused silica products, carbon bisulphide, calcium carbide, fixation of atmospheric nitrogen, and a multitude of other electrothermic developments, will find the Company's experience in this line of value.

The design of a proper electric furnace for an industrial chemical operation is a problem in electrical engineering as much as in chemistry or metallurgy. The furnace specialists of the General Electric Company will cooperate in the proper design of your furnaces from the electrical engineering point of view, advising as to all the latest improvements in regulating devices, transformers, reactances, motor generators and special cables, and as to the best utilization of the sources of energy at your disposal.



**G-E MOTORS AND CONTROL PANEL FOR OPERATING CALCIUM CARBIDE FURNACE ELECTRODES**

**Electric Melting Furnaces** are the most efficient and economical apparatus for melting non-ferrous metals and alloys. By means of the G-E electric furnace the highest quality of product can be secured with a minimum loss of volatile alloys. Working conditions are vastly superior to those where fuel-fired furnaces are used. This furnace is furnished complete with motor-operated electrode and tilting mechanisms



**G-E BRASS MELTING FURNACE WITH AUTOMATIC CONTROL**

and all electrical accessories, such as transformers, switching and metering equipment, automatic electrode control and pyrometer. Electric current may be taken from either a 2-phase or 3-phase line.

This furnace is suitable for melting practically all non-ferrous metals and alloys. Its distinctive features and specific advantages of electric melting are listed in Bulletin 68700.

The G-E Induction Furnace is essentially a transformer in which the entire energy transferred to the secondary circuit is absorbed therein in the form of heat. The secondary circuit consists of a ring of the metal which is to be heated or melted.

The principal field of application for this type of furnace is in the refining of steel, cast iron and malleable iron of high quality. Other uses are the reclamation of expensive alloy steels, and the melting of ferro-manganese preparatory to alloying steel in the liquid state.

The furnace consists essentially of a steel shell, lined with heat insulating and refractory materials to form the hearth surrounding the metal charge. The pancake shaped primary coil is located just above the roof, thus removing it from danger of damage by hot metal. The furnace is tilted by a motor in the conventional manner.

Additional details will be given upon request.

#### **4000-LB. INDUCTION FURNACE**

In regular production of special steel this furnace has poured a 1-ton ingot every (approx.) 4 hours for 555 consecutive heats before it was necessary to reline it.

**Electric Heat-Treating Furnaces**—The G-E electric muffle furnace meets the demand for a convenient, economical and durable furnace for temperatures up to about 1550°F. For heat-treating carbon steel and experimental purposes. (Bulletin 69702.)

Another type, distinctive in design, is the Semi-Cylindrical Furnace. The heating unit, located in the furnace chamber, radiates heat directly to the charge. This produces rapid heating and gives uniform temperature throughout the chamber. This type of heating unit responds more quickly to automatic control and operates at lower temperature for any given temperature in the furnace chamber than any other type—insuring long life.

For existing heat-treating furnaces this Company has developed electric heating equipment with automatic temperature control. This includes electric equipment only, furnace structure to be provided by purchaser. Advantages of electrically heated and controlled furnaces are given in Bulletin 69705.

Heat-treating problems should be referred to the industrial heating specialists in the nearest G-E sales office.

**Electrically-Heated Oven Equipment**—The electrically heated oven is being used in the chemical industries for various drying and baking processes. In one plant three electrically heated tunnel type drying ovens used to dry coils of steel rods, after dipping in an acid bath and coating with lime, have replaced seven ovens heated by natural gas. The electric ovens are brought up to temperature 380°F. in a small fraction of the time required for heating the gas ovens. The drying is done in about one-fourth the time.

Formerly the drying of effervescent salts was done in gas-heated ovens, but the results were not always satisfactory, due to over or under baking, particles of dirt in the salts, and burning, which meant that the entire bake had to be thrown away. With electric heating these difficulties have been overcome.

*Continued on Next Page*



The General Electric Company makes various types of oven heaters and also panels for automatic control, d-c. and a-c, single-phase or 3-phase. The heaters are made in capacities from 1.3 kw. to 123 kw., up to 600 volts. These give temperatures up to 950°F. in the oven. (Bulletin 48021A)

**Arc Welding Equipment**—The art of welding has been known practically since the advent of metal in industry, but autogenous welding has been commercially used only during the last few years. By the latter method, metals are joined by fusion. The General Electric Company has developed four principal types of arc welding equipment designed to meet most every condition where it is possible to join metals by means of the electric arc.

These equipments include motor generator sets, either single or multi-operator types, furnished either portable or stationary. They may be equipped for operation from any standard electrical circuit or the generators may be driven by mechanical power. (Bulletin 48932A)

The G-E automatic welder is a mechanical device to feed the metallic electrode to the work automatically. It is for use on d-c. circuits only. As it can operate continuously for hours at a time and maintain a constant arc length, and therefore constant welding heat, it will make a more uniform, more successful, and more rapid weld than can be accomplished manually.

This machine is particularly adaptable to routine duplicate welding, such as building up worn or undersized shafting, and welding seams of tanks or barrels. (Booklet B-3575)

**Welding Accessories**—Electrode holders for metallic or carbon electrodes, extra flexible cable for attaching to electrode holders, face masks and head shields may also be supplied on short notice.

**Electric Rivet Heaters**—The G-E electric rivet heater will be found useful as part of the repair equipment of a chemical plant in connection with the repair of structural iron work, steel cars and tanks. The use of an electric rivet heater offers many advantages over fuel-fired methods, such as, portability; economy in power used and in successful heating; and the elimination of fire hazard. (Bulletin 69701A)

**G-E ELECTRIC RIVET HEATER**

**Electric Sherardizing**—Metal to be rendered non-corrosive is sherardized by being electrically heated in the presence

of zinc. In order to secure the best results and obtain uniformity as well as durability of coating, it is necessary to have unvarying quality of zinc dust and to maintain a certain correlation between the composition of this dust and the sherardizing temperature. Electric heat is ideal for this purpose as the temperature can be maintained with absolute certainty. Bulletin 48926 describes G-E electric sherardizing machines and gives other points regarding this process.

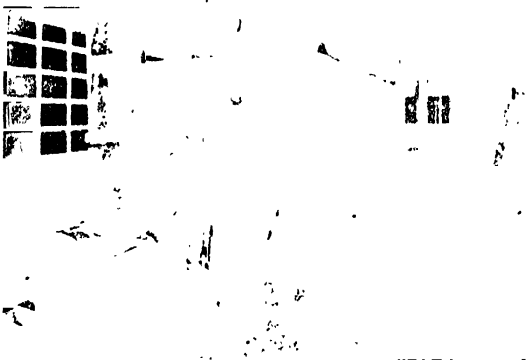
**Metal Melting Pots**—This Company has developed an electrically heated pot for melting lead, babbitt and similar metals. Automatic regulation is the principal feature—when cold metal is put into the container it is melted quickly by the initial rise of current, after which the current automatically decreases to a value just sufficient to keep the metal molten. (Bulletin 69703.)

**Industrial Kettles**—The General Electric Company is prepared to furnish heating equipment for kettles and tanks for heating various substances such as oil, paraffin, solutions and compounds, where the purchaser provides the tank and foundation and installs the heating equipment. When requesting prices submit complete requirements.

**Cartridge Type Heating Units**—For concentrated or localized heating, the cartridge unit provides a more efficient method of heating than gas or steam. The G-E cartridge unit can be furnished for operation on any commercial voltages from 100 to 250 volts. They are now being used for heating various forms of laboratory apparatus, glue pots, soldering irons and small boilers. (Bulletin 69704)

## MOTOR DRIVE IN CHEMICAL INDUSTRIES

G-E equipment for mechanical drives in industrial chemical plants includes motors and control of special design to meet the severe conditions imposed upon such machinery. Electric motors must be built with special insulation to withstand the acid and alkaline conditions, especially where there is no ventilating system to take care of waste gases or where location of motor necessarily exposes it to frequent acid splashes or sprays. G-E motors are in use throughout the chemical industries successfully resisting the destructive influences of corroding fumes, or moisture, dust and grit laden air and of extremes of temperature.



**G-E MOTOR DRIVING MIXING MACHINES UNDER SEVERE ATMOSPHERIC CONDITIONS**

Continuous operation, 24 hours a day, which is often demanded, naturally imposes severe strains on the electrical driving and controlling equipment. The best recommendation for G-E equipment of this class is the fact that it is giving satisfactory service in just such installations.

Chemical plants using motors in locations where the air is charged with inflammable vapors or dust can obtain starting and regulating equipment that will eliminate risk of fire or explosion. Further informa-

*Continued on Next Page*

tion should be obtained from control specialists, located in G-E sales offices. See page 508.

**Air Compressor Drive**—Almost every chemical industry requires compressors for air or some other gas. G-E synchronous motors are extensively used for this service and have been selected for some of the largest installations in the world



**G-E SYNCHRONOUS MOTORS DRIVING AIR COMPRESSORS**

A great power saving can be accomplished in plants where air is used for transferring or agitating liquids and operating blowpipes and furnaces by starting and stopping the compressor electrically. When this is done automatically, dependent upon air pressure, water level, etc., it saves the cost of attendants as well as cost of power when machines can be shut down. G-E pressure governors and switches are available for the control of electric motors in this service.

**G-E centrifugal compressors or blowers**, direct coupled to electric motors or Curtis steam turbines are designed for large volumes and low pressures such as are required for operating furnaces, kilns, dryers and ovens; agitating water and other liquids in all kinds of chemical and oil refining plants, agitation in sewage disposal plants, propelling gases through tower systems and scrubbing apparatus; blowing water gas generators; and ore flotation plants.

The blower or compressor is designed similar to the well-known centrifugal pump but differs from the ordinary fan blower in that it is provided with discharge or diffusion vanes which convert the otherwise lost energy of velocity into pressure energy, resulting into high overall efficiency. The blower is completely housed. Blower and driver being direct-connected means a minimum number of bearings, small floor space required, and elimination of shafting, which is especially undesirable in chemical plants where the atmosphere is generally charged with fumes, moisture and dust (Bulletin 48609.)



**G-E MOTOR-DRIVEN CENTRIFUGAL GAS BOOSTERS**

**Pumping**—The industrial chemist recognizes that without solution there would be no chemistry, and usually converts his bulk materials into liquid form in the early stages of the process. Chemical engineering problems, therefore, are largely those of handling liquids efficiently, and the most generally useful machines for this purpose are electrically operated centrifugal rotary and plunger pumps.



**G-E VERTICAL PUMP MOTORS, NEW CORNELIA COPPER CO.**

Each motor is protected from the weather by special housing

There are G-E motors for driving pumps of all types. Some of these are specially built to withstand conditions of excessive moisture and can be neglected for long periods, making them suitable for inaccessible locations.

Standard G-E pump motor control apparatus is available which can be operated at will or which will stop pumps at certain tank levels or at predetermined pressures. (Bulletin 61301.)



**G-E MOTORS DRIVING CENTRIFUGAL PUMPS IN WATER SOFTENER HOUSE**

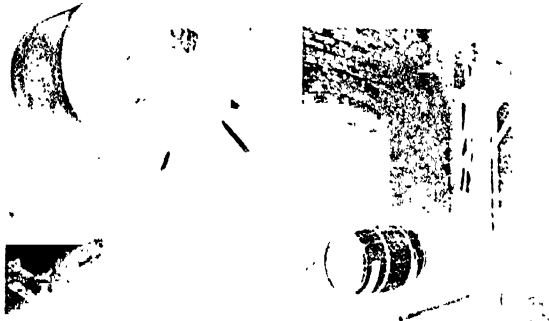
**Material Handling**—In many of the chemical industries where the efficiency of the chemical processes involved has been brought by careful research to a high degree of perfection, there is an opportunity for the introduction of further economies by the use of modern electrically operated material-handling machines. It has been demonstrated in numerous installations, in plants handling wide variety of materials, that electrically operated equipment is the most flexible, rapid and dependable for mechanical handling.

The General Electric Company has developed much special electrical apparatus for driving and controlling these mechanical appliances. Particularly for material handling processes is special control essential. Automatic equipment renders remote control possible and effectively reduces the amount of labor required to operate plants handling large tonnages of material.

The Company's engineers who specialize on problems of this kind are at your disposal to assist in the design of new installations or in the electrification of present equipment. When you submit your material-handling problems to a

*Continued on Next Page*

manufacturer of this equipment specify "G-E" motors and electric control. This insures you the specialized service of G-E engineers cooperating with the machinery manufacturer for the satisfactory solution of your problem.



G-E MOTOR DRIVING RECLAIMING CONVEYOR

HANDLING BARRELS ELECTRICALLY IN ALUM PLANT

**Crushing and Grinding**—The diversified crushing and grinding operations in the chemical and metallurgical industries require a versatile line of motors. The ball mills shown grind tons of ore per hour. Other installations reduce costly pigments to a fineness necessary for printing inks and high grade enamel, requiring very different motors.

Whatever the electrical problem involved in these drives, there is suitable G-E equipment. To mention the substances crushed, ground and pulverized by power from G-E motors would be to list almost every material known to these industries.



AN INSTALLATION OF 40 MILLS, EACH DRIVEN BY A G-E MOTOR, INSPIRATION CONSOLIDATED COPPER COMPANY

**Small Power Needs**—The small manufacturing and testing equipment of the chemical plant and laboratories, requiring a small amount of power, can often be electrified, thus releasing workers for other duties. Small electric motors have been successfully applied to small crushing, grinding and



BATTERY OF SPECIAL MACHINES IN FOOD PRODUCTS PLANT DRIVEN BY 3 H.P. MOTORS

mixing machines; centrifuges; small pumps compressors and blowers; stirrers and agitators; and various shop tools.

This Company has studied extensively problem of small electric motor applications. G-E engineers have given careful attention to the demands for dependability, quiet running and efficiency and have developed a complete line of motors

for driving the light machinery of plant, laboratory and machine shop.

These motors can be obtained in fractional horsepower sizes as small as 1/200 h.p., for operation on either alternating or direct current. They are designed and built with the same care as the larger G-E motors. Submit your small-power problems to the nearest G-E office or send for Bulletins 61509 to 61512.



FRACTIONAL HORSEPOWER MOTOR USED WITH THERMOMETER TESTING TANKS

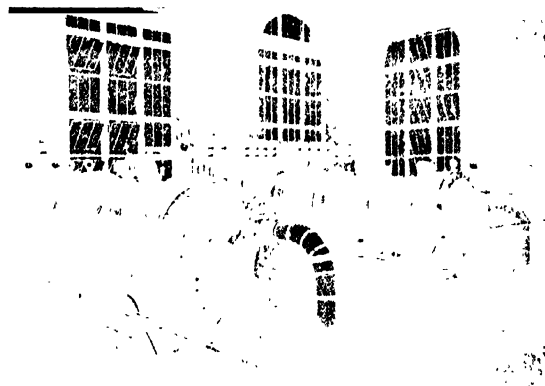
## POWER PLANT EQUIPMENT

The General Electric Company is in a position to supply complete electrical equipment for generating electricity from steam, gas, oil or water power. While the Company's facilities enable it to handle the very largest power development propositions, the needs of the manufacturer requiring only a small amount of power are given careful attention, and small chemical plants requiring power for lighting or other purposes, will find complete equipment for their needs.

G-E automatic station control equipment has been developed to meet a wide variety of conditions. It has been successfully applied to the control of synchronous converters, motor generators, synchronous condensers and hydroelectric generators. Automatic stations offer an opportunity for new and important economies. More than 100 are now in operation. (Bulletin 40604.)

## CURTIS STEAM TURBINES

G-E Curtis Steam Turbines have proved successful not only in large central stations, but in extensive applications in chemical plants, sugar mills, refineries and manufacturing establishments of all kinds.



TWO 500-KW. CURTIS TURBINE GENERATORS

*Continued on Next Page*

Curtis turbines are built in sizes of 10 kw. to 2000 kw. with d-c. generators, and from 100 kw. upward with a-c. generators. They are arranged for non-condensing or condensing operation with or without superheat. (Bulletins 42010A and 42201A.)

**Small Mechanical Drive Turbines**—A special form of G-E Curtis steam turbine is adapted to driving centrifugal pumps, fans, blowers and other like apparatus. As in the case of the large G-E Curtis turbines, the best materials and workmanship are employed to insure reliability and efficiency. (Bulletins 42019 and 62015.)

### SWITCHBOARDS

The General Electric Company offers a complete line of switchboards for all systems of electrical distribution. Standard unit panels may be ordered direct from switchboard bulletins. Brief information on these types is given in Index Bulletin 47001A.



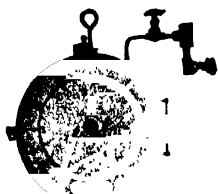
**G-E SWITCHBOARD IN POWER HOUSE OF CHEMICAL PLANT**

The Company has given much attention to questions of safety in switchboard operation and has developed several types of safety-enclosed switchboards which have proved very successful in service. Information on these designs is given in Bulletins 47100, 67105A and 67110.

All equipment on G-E switchboards—meters and instruments, relays, switches, circuit breakers, etc., is made by a single company, which centralizes responsibility for the operation of the entire board.

### FLOW METERS

G-E flow meters provide a means of accurately measuring the total flow of steam, water, oil, air or gas through pipes, furnishing information of great value in an economical management of any manufacturing industry. They are valuable to the chemical plant for measuring the amount of steam generated or used in the power plant, or distributed for heating or for various processes; the amount of water pumped, delivered to boilers, or consumed in plants; the amount of air delivered to furnaces, to a plant department, etc. (Bulletin 46501D.)



**G-E FLOW METER**

### TRANSFORMERS

G-E transformers embody features which have made them preferred by the great central stations of this

country. Reliability has always been the first consideration and the many thousands of kv-a. capacity now in service have proved their ability to operate continuously with minimum losses and maximum factor of safety. (Bulletin 45110A.)

Special transformers for laboratory and experimental purposes are manufactured for any voltage, current or frequency. Tell the nearest G-E office what power sources are available and what you wish to accomplish.

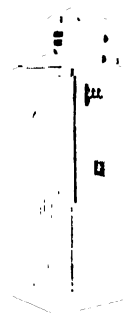


**DISTRIBUTION TRANSFORMER**

### VOLTAGE REGULATORS

G-E generator voltage regulators, a-c. and d-c., are designed for panel, bracket and pedestal mounting. Feeder voltage regulators, hand or motor controlled, for standard single-phase or polyphase circuits, are available for indoor and outdoor service and pole mounting. (Bulletin 45450.)

Small sizes of feeder voltage regulators are also designed for outdoor installation to take care of industrial plants using both lighting and power service.



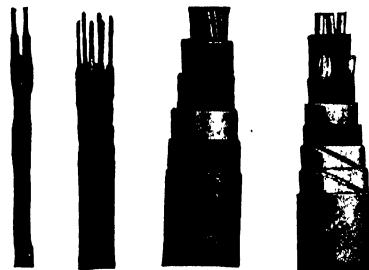
**FEEDER VOLTAGE REGULATOR**

### LIGHTNING ARRESTERS

G-E lightning arresters are available for protection of all kinds of service: aluminum and oxide film types for large a-c. stations, Bulletins 45601B and Y1441; magnetic blowout and d-c. aluminum types for railways, Bulletin 44712; multi-gap types for distribution circuits, Bulletin 45603A; and vacuum tube arresters for signal circuits, Bulletin 45600A.

### WIRES AND CABLES

The General Electric Company manufactures insulated wires and cables suitable for use under all conditions pertaining to the distribution of electricity in industrial plants, including suitable forms for use in chemical plants, by-product coke ovens, explosive plants, and elsewhere where excessive moisture, corroding fumes, extremes of temperature, or other severe



**SOME G-E WIRES AND CABLES**

*Continued on Next Page*

conditions may be present. General information on this line is given in Bulletin 49305.

### VENTILATING OUTFITS

Self-contained exhaust fans adapted for ventilating laboratories, shops, factories and office buildings, or for use in chemical plants, dye houses, laundries, paper mills and other industries where it is desirable to remove steam, moist air, dust, smoke and odors, or to exhaust noxious gases and fumes which attend certain processes of manufacture. They are usefully employed also to dry chemicals, dyes, drugs, cloth, paper, wool, tobacco, asbestos, bricks, clay, etc. Sizes from 12½ in. to 48 in. with a-c. or d-c. motors. (Bulletin 41810.)



G-E EXHAUST FANS

### WIRING SUPPLIES

The line of G-E wiring devices is very complete and includes porcelain and other weather-proof types for outside wiring about the plant. Brief information is given in Bulletin Y 1270, obtainable from G-E Sales Offices. Stocks of these devices are carried by dealers in electrical supplies.

### INSULATING MATERIALS

These materials are developed from careful research and made primarily to meet the requirements of G-E products. They are offered to others for general electrical repair work. Varnishes, japans, oils, sealing compounds and paints are described fully in Bulletin 48703. For treated fibers and papers and also asbestos tape and treated cloths see Bulletin 48715.

### ELECTRICALLY OPERATED VALVES

G-E solenoid operated valves are for remote control liquid or gases under pressure. They can be operated by means of a float switch, thermostat or hand switch. Tanks connected with piping for liquids, steam, compressed air, etc., which are located at various elevations or in inaccessible places, can be arranged for control from a central point by the use of this valve. It is built for connection to 1 in. pipe or smaller.

ELECTRIC VALVE

### PLANT LIGHTING

**G-E Flood Lighting Projectors** throw a beam of light of an enormous candle power. They can be located at any convenient place up to 500 ft. away from the object to be illuminated. They are weather-proof, sturdily constructed and exceedingly economical to maintain. They are useful for such work as loading and unloading ships and cars, or making plant alterations at night, and for protecting property against mob violence and theft. (Bulletin 45850B.)



FLOOD LIGHTING PROJECTOR

**G-E Searchlights** are also suitable for night work illumination. The Company makes both incandescent

and arc lamp types, the latter in sizes from 9 to 80 in. diameter. They are arranged for hand, shaft, rope or electrical control. (Bulletin 43856.)

**Color Matching Outfits**—This equipment satisfies the demand for a low-priced illuminant that will show colors in their true values. It is used in dyeing and finishing plants, dyestuff plants, textile mills, printing ink factories, chemical plants, paper mills, and general testing and research laboratories.

It furnishes practically the same light as comes from a clear north sky, and thus enables many processes to run continuously that formerly could only be run in the daytime under favorable weather conditions.

### ELECTRIC INDUSTRIAL HAULAGE

Electric locomotives are admirably adapted for use in the chemical industry, possessing many advantages over steam locomotives, animal haulage and hand trucks. In large plants they will save heavy switching charges for moving freight and tank cars about the yard.

G-E electric industrial locomotives are furnished for standard and narrow gages in standard sizes varying from 4 to 50 or more tons and for operation from trolley, third-rail and storage batteries. Units in service in chemical and various other industries are illustrated in Bulletin 44251.



G-E STORAGE BATTERY LOCOMOTIVE HAULING SALT CAKE

### BATTERY CHARGING EQUIPMENT

The General Electric Company is prepared to furnish a complete line of battery charging equipment, adapted not only to all ordinary needs in connection with the operation of storage-battery trucks, locomotives, motor vehicles, storage battery installations in laboratories, etc., but also suitable for all plant and laboratory purposes where a convenient source of direct current is desired, and where the installation of more expensive d-c. generating equipment is not warranted.

Consult the nearest G-E office, stating kind of charging service required.

### PRECIPITATION OF FUMES AND SMOKE

The Cottrell electrical precipitation process has found several applications, such as recovering and collecting fumes and dust from gases, recovering tar and oils, and cleaning the air drawn from buildings. The electrical equipment for this process is of very special type. This Company can furnish all of this electrical equipment, described with its application in Bulletin 49137.

# GENERAL MACHINE COMPANY

Builders of Chemical Machinery  
398 MARKET STREET, NEWARK, N. J.

## PRODUCTS

Ball Thrust Bearing "Overhung" Agitators, Mixers or Stirrers for Wood, Iron or other Metallic Tanks. AGITATORS

We make a specialty of agitating machinery. The Ball Thrust Bearing Agitators here described have proved successful and are being used in a great many chemical, pottery, mining and other industrial plants throughout the United States and Canada.

They have given users long service and complete satisfaction.

**Sizes and Dimensions** Our ball thrust bearing agitator is made in four sizes:

No. 0 for tanks 2'0" diameter x 2'0" deep or smaller

No. 1 for tanks 4'0" diameter x 4'0" deep or smaller

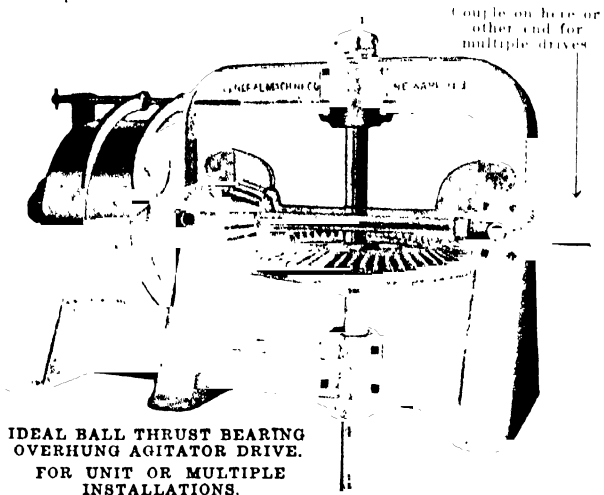
No. 2 for tanks 8'0" diameter x 6'0" deep or smaller

No. 3 for tanks 12'0" diameter x 8'0" deep or smaller

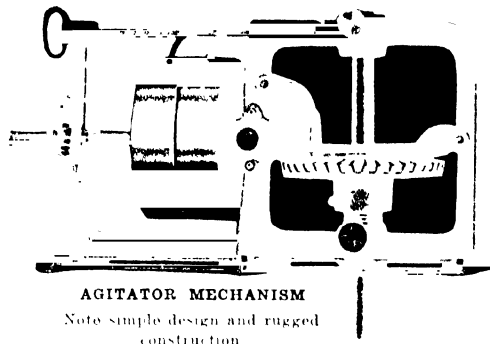
If your requirements are of special dimensions or construction, send us sketches and we will be pleased to give prices and full details.

## OVERHUNG AGITATOR DRIVE

The accompanying illustration shows the Ideal Ball Thrust Bearing Overhung Agitator Drive for unit or multiple installations.



IDEAL BALL THRUST BEARING  
OVERHUNG AGITATOR DRIVE.  
FOR UNIT OR MULTIPLE  
INSTALLATIONS.



AGITATOR MECHANISM

Note simple design and rugged construction

## MIXERS

The mixers can be operated collectively or independently, as they are equipped with spiral jaw

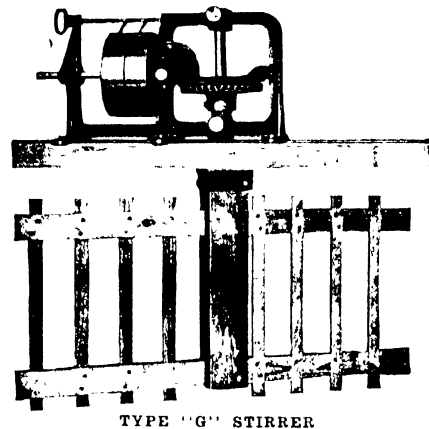
clutches. They can be equipped with any type of stirrer.



GANGUE MIXERS

## STIRRERS

The stirring paddles illustrated herewith are a few of the many designs we are prepared to furnish. They are well designed and ruggedly built.

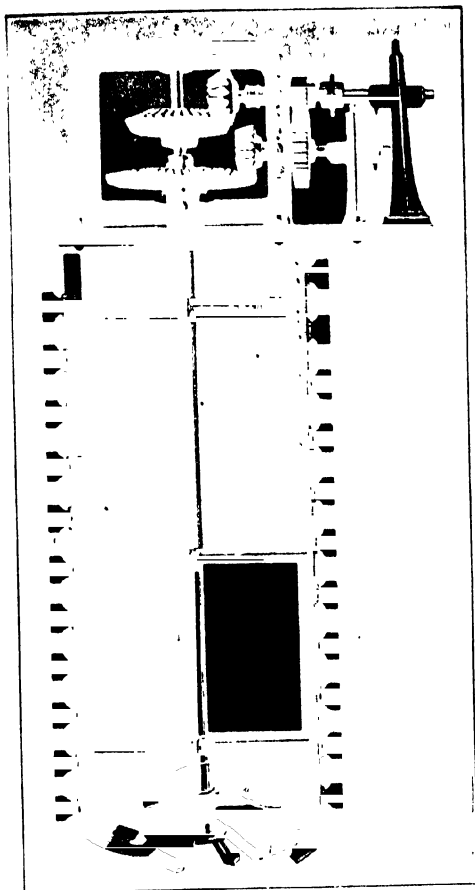


TYPE "G" STIRRER



TYPE "A" STIRRER

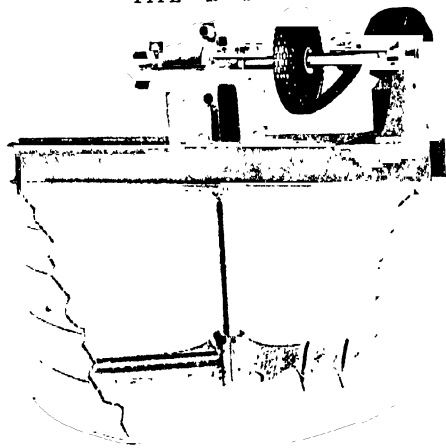
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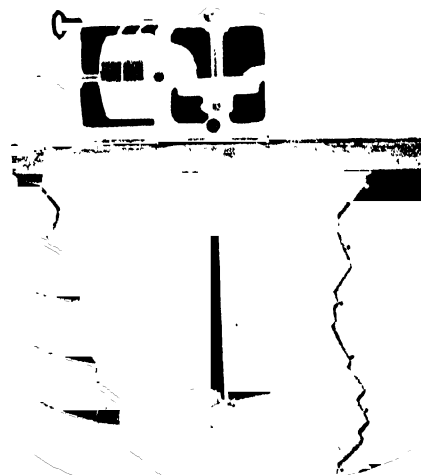
SPECIALLY DESIGNED AGITATOR



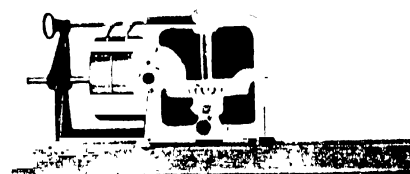
TYPE "R" STIRRER



TYPE "W" STIRRER



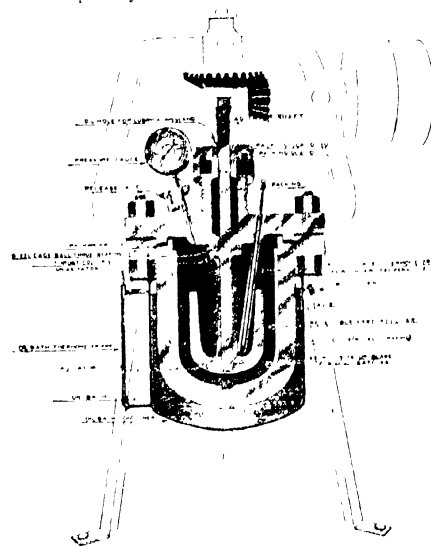
TYPE "T" STIRRER



TYPE "P" STIRRER

## AUTOCLAVES

We make a specialty of Laboratory Autoclaves for experimental and semi-commercial work in sizes up to 5 gallons' capacity.



AUTOCLAVE

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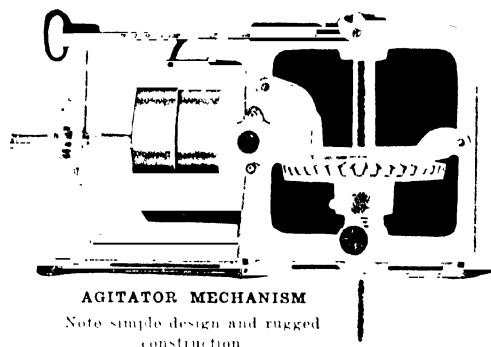
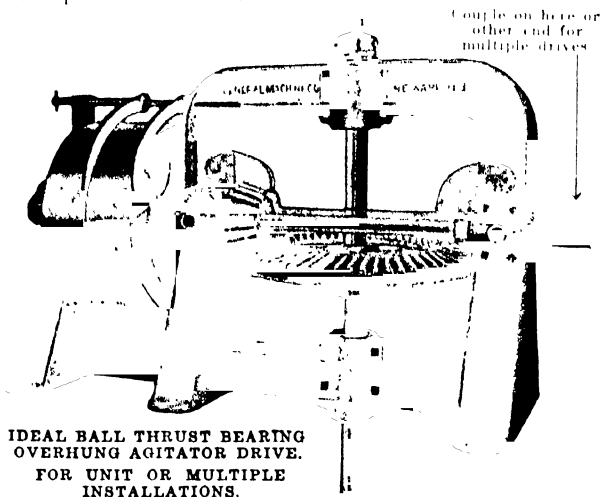
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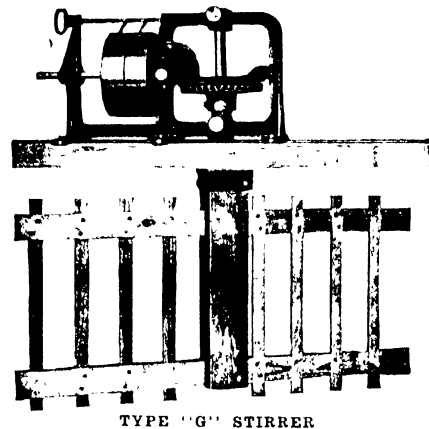
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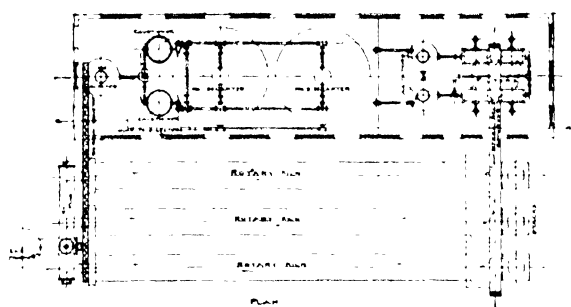
TYPE "G" STIRRER



TYPE "A" STIRRER

*Continued on Next Page*





DETAILS OF COMPLETE CAUSTICIZING PLANT

### CONTINUOUS CAUSTICIZING WITH LIME RECOVERY AND REUSE

Our apparatus is built for the specific purposes indicated in the above title. It is the work of our consulting engineer, who for nearly twenty-five years was general manager and chief designing engineer of one of the large alkali plants in this country. The apparatus has been in successful operation for some eight years, and is highly efficient, both as regards economy in the use of raw material and saving in labor.

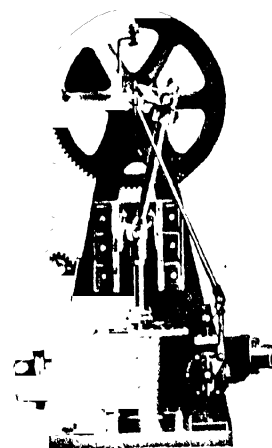
The complete plant which we furnish consists, as indicated in the sketch, of a continuous causticizer, decanter, rotary filter, rotary kiln, gas producer, lime slaker and auxiliary apparatus such as vacuum pump, lime and liquor pumps and sludge agitator. All apparatus works continuously. The causticizer is heated with exhaust steam and supplied continuously, by means of pumps, with calcium hydrate and sodium carbonate in the proper proportions. The continuous discharge of caustic liquor and lime sludge is delivered by pumps to the decanters, the clean caustic drawn from the top and the mud from the bottom; taken by pump direct to the sludge agitator from whence it flows to the filters, and the dried cake delivered by belt to a rotary kiln, fired with gas, from whence the recovered lime is returned to the slaker to be used again.

With good grade of lime 90% of the sludge can be recovered. The alkali loss is, with careful working, almost nil. All of the apparatus is of heavy construction, and specially designed for the work. The proc-

ess being continuous the steam consumption is much less than that of the batch process, moreover the process does not require live steam, exhaust at 10 pounds pressure being ample to operate at maximum capacity.

### EXHAUSTER

This exhauster is a well designed high efficiency piston displacement machine with extremely low clearances, showing indicator cards closely approximating the ideal for apparatus of this character. The apparatus is simple in construction, of few parts which are easily accessible for oiling and adjustment, and is capable of long periods of continuous day and night operation without stoppage for adjustment.

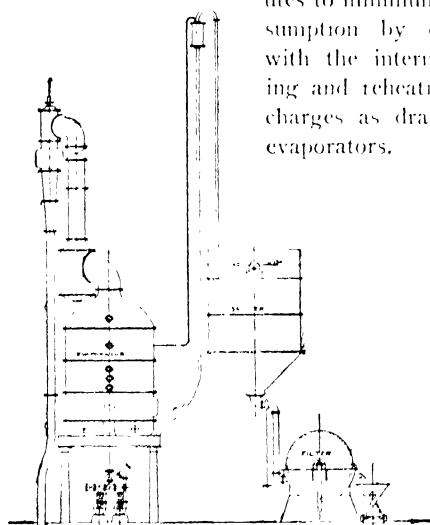


EXHAUSTER

### SALTS APPARATUS

This apparatus, backed by a number of years of successful service, is intended to make what is now generally an intermittent operation, continuous, and in a large sense automatic. Moreover the apparatus is of a character requiring no more attention than can be given it by the man in charge of the evaporator. In other words, it can be operated without extra labor.

One of the most important features is that it permits continuous operation of evaporators without periodic drawing off and refilling, consequently it contributes to minimum steam consumption by doing away with the intermittent cooling and reheating of batch charges as drawn into the evaporators.



APPARATUS FOR CONTINUOUS REMOVAL, FILTERING AND WASHING OF PRECIPITATED SALTS FROM EVAPORATORS

# GIFFORD-WOOD COMPANY

## General Elevating and Conveying Machinery and Ice Tools

OFFICES AND STOCK ROOMS  
Boston, 24 Milk St.  
Chicago, 565 W. Washington Street

MAIN OFFICE AND WORKS  
HUDSON, N. Y.

OTHER BRANCHES  
New York, 50 Church Street  
Buffalo, Electric Building

### PRODUCTS

Elevating and Conveying Machinery of all types for handling bulk, package, bag or barrel goods.

Wagon Loaders and Car Unloaders.

Coal Handling Machinery, and Pockets.

Ice Elevators, Conveyors, Crushers, Carts and Tools.

G-W Pivoted Bucket Carriers.

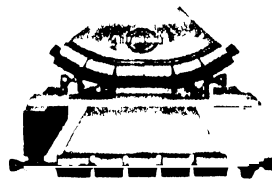
Bagging Machines; Friction Clutches; Hoists.

Screens of all types.

Castings for Chemical Plants.

### BELT CONVEYORS

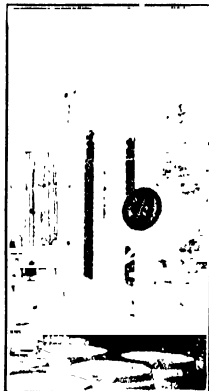
These conveyors are efficient for large capacities over long hauls. Light, therefore require only light supports. Furnished with adjustable troughing rollers. Adaptable on inclines up to 20° from horizontal. Will handle any bulk material.



BELT CONVEYOR

### BARREL ELEVATORS

These elevators are made up with projecting arms fastened between two strands of chain running vertically or inclined between sprocket wheels. They take barrels from loading platform and deliver over head wheels to inclined runway or storage room. Also supplied to lower barrels from upper to lower floors.

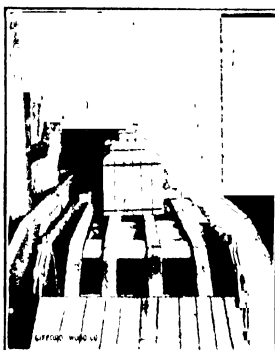


BARREL ELEVATOR

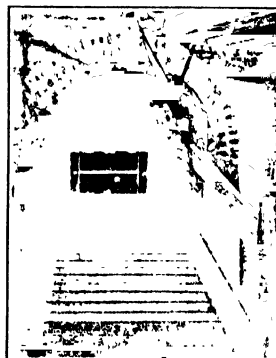
### SLAT AND APRON CONVEYORS

The slat type consists of wood bars fastened between two chains at intervals. Used on the horizontal or incline for handling packages along skidways. Often placed at floor level.

The apron type consists of wood slats, with a small space between, each end of which is fastened to a link of conveyor chain. These conveyors are useful in moving case, barrel, sack, or bale goods on level or incline.



SLAT CONVEYOR



APRON CONVEYOR

### PIVOTED BUCKET CARRIER

A series of overlapping buckets, pivotally suspended between two endless chains. Constructed to meet extremes of service in plants where large capacities and constant service are required. Material can be loaded and charged at any point.



PIVOTED BUCKET CARRIER. UPPER CONVEYOR RUN OVER BUNKERS

### BUCKET ELEVATORS

For handling lumpy or granular materials in bulk from level to level on vertical or sharp inclines bucket elevators are the most economical.



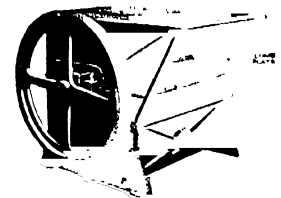
BUCKET ELEVATOR  
IN ASH PIT



BUCKET ELEVATOR  
Handling Crushed Ice at Ice Cream Plant

### ICE CRUSHERS

Creasey Ice Breakers are exceedingly efficient for chemical plants and laboratories requiring large amounts of chopped ice. Made in a number of sizes to suit requirements; the size of the cracked ice produced can be varied. Operated by hand or power. Booklet with complete description on request.



ICE BREAKER

### FRICITION CLUTCHES

This is a ruggedly constructed clutch. Made in types suitable for low or high speed, also light or heavy duty. Adaptable for use on elevating and conveying machinery, centrifugals, agitators, mixers, etc.



SCREW FRICTION CLUTCH



Cable Address  
GLASPECO

# GLASS SPECIALTY COMPANY

Incorporated 1913

Manufacturers of

Laboratory and Chemical Glassware

235-239 PLANE STREET, NEWARK, N. J.



Telephone  
MARKET 384

## PRODUCTS

### Adapters

Alundum, crucibles, filters, etc.

Analytical balances, Chainomatic

Bacteriological apparatus

Beakers, glass

Biological apparatus

Bulbs

Burettes, all kinds

Burners, all kinds

Condensers, Liebig, bulb and spiral

Crucibles, porcelain, clay, nickel, etc.

Cylinders, glass plain, graduated and nessler

Dishes, Petri

Drying ovens

Experimental work to blue print and specifications

Extraction apparatus—all kinds

Flasks—glass all kinds

Filter paper, Whatmans, Pratt Dumas, Munktells  
and American

Freas Vacuum Ovens

Funnels

Gas Analysis Apparatus

Glassware, chemical and laboratory

Glincky's tubes

Generators

Hydrometers and jars

Incubators

Jars—all kinds

Laboratory hardware

Lactometer

Milk testing apparatus

Mortars and pestles, glass and porcelain

McLeod gages

Nitrogen Determination apparatus

Oil testing apparatus

Orsat Manifolds and pipettes

Porcelain ware, Ohio, Coors and imported

Pyrex glassware and tubing

Quartz Ware

Retorts, glass and metal

Rubber stoppers and tubing

Saccharimeters

Scales and weights

Silica Ware

Specific Gravity bottles and balances

Sterilizers

Test tubes

Thermometers and hydrometers

Tubes, potash, distilling, etc.

Vacuum apparatus and pumps

Wash bottles

Wooden ware for laboratory

## NO. 825

### BOTTLE, SPECIFIC GRAVITY

With "ground in" centigrade thermometer, divided in  $1/5$  degree, and stoppered in capillary tube.

## SERVICE

In our own Manufacturing Department we give prompt service to those firms desiring special glassware.

## NO. 900

### SAND GLASSES

Unmounted or mounted in polished wooden frames. Times to periods of from  $1/2$  to 30 minutes. Sand runs smooth and uniform.

## GLASS BLOWING

We are especially equipped to handle orders for Special Glass Parts and Apparatus used in Research, Experimental and Scientific Work in Laboratories and Industrial Plants.

## NO. 986

### DISTILLING TUBES

With pear shaped bulbs for fractional distillation. We are manufacturing and have in stock all kinds of fractional distilling tubes.

## GRINDING AND DRILLING

In our Grinding Department we are prepared to do grinding of all kinds including stopcocks, glass joints and drilling holes through glass.

## ENGRAVING AND GRADUATING

Engraving, Etching, Graduating and Calibrating done accurately and well by experts. All our work checked against Bureau of Standards and can be certified at regular additional cost.

## NO. 2800

### EXTRACTION APPARATUS

For rubber analysis of special dimensions, as recommended by the Joint Rubber Insulation Committee.

## REPAIR WORK

Do not scrap your broken apparatus. Bring them to the "Glass Doctor." All kinds of repairs done promptly.



SPECIFIC  
GRAVITY  
BOTTLE



SAND GLASSES



DISTILLING  
TUBE



EXTRACTION  
APPARATUS

# GLANDER AND COMPANY

Sales Engineers

800 BROAD STREET, NEWARK, N. J.

Cable Address  
"CHASTECH" N. Y.

## PRODUCTS

Tanks	Kettles
Dryers	Grinders
Stills	Reducers
Mixers	Nitrators
Pumps	Digesters
Cranes	Autoclaves
Motors	Ball Mills
Engines	Evaporators
Boilers	Vacuum Pumps
Heaters	Centrifugals
Turbines	Sulphonators
Condensers	Vacuum Pans
Hydraulic Presses	Filter Presses
Glass Enameled Tanks	Alcohol Distillation and
Refrigerating Equip-	Rectification Apparatus
ment	

## SERVICE

**New Equipment**—This organization specializes in equipment for the chemical industry. We are prepared to furnish engineering advice and contract for the erection of complete plants.

We have facilities for the manufacture of chemical apparatus in various metals, workmanship first-class, and materials the best obtainable.

We are prepared to quote upon equipment following customers' designs and specifications, or our own designs, which follow the latest approved practise.

The illustrations are of equipment actually built and now in use, and show the varied types of work we are prepared to handle.

**Used Equipment** We purchase and dispose of chemical process, refrigerating and power equipment.

Only such equipment as passes the rigid physical inspection imposed by our engineers is offered and sold, and we submit complete reports to our clients, based upon such inspection.

## WARRANTY

All equipment is warranted in first-class physical and operating condition, and to efficiently perform the service for which it was manufactured.

## JACKETED KETTLE

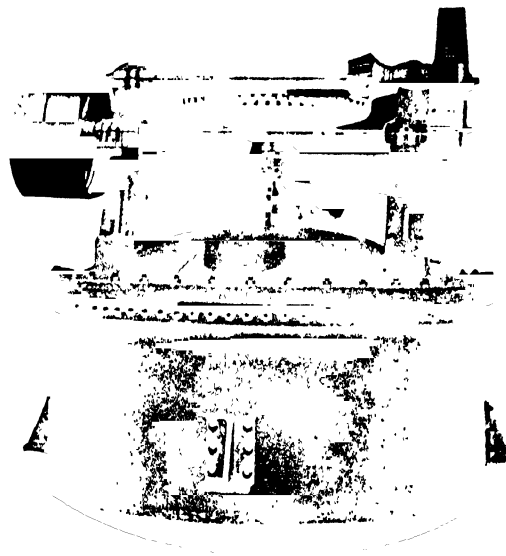
Open top, Jacketed Kettle, seamless welded or riveted construction, shapes and capacities to suit customers' requirements.



JACKETED KETTLE

## MIXING KETTLE

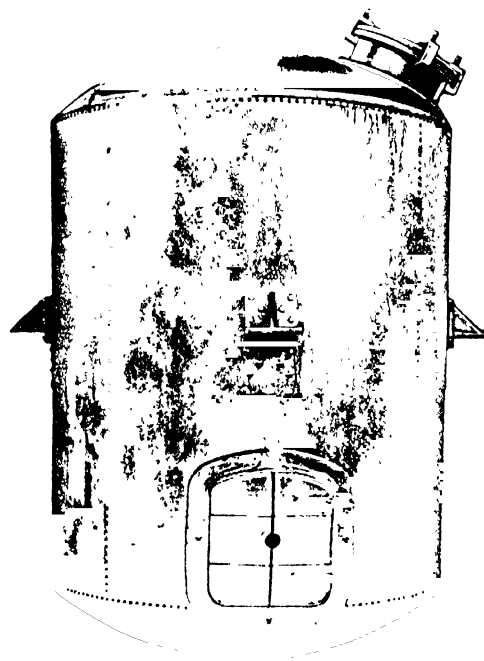
Jacketed Mixing Kettle, with autogenous inside and outside shell seams, cast-iron bolted cover. Heavy stirring device, double reduction gear drive. For high pressure the inside shell is made of forge hammer weld construction.



JACKETED MIXING KETTLE

## OIL FILTER

Rolled steel, special Oil Filter, built in sizes and with openings to meet customers' requirements.

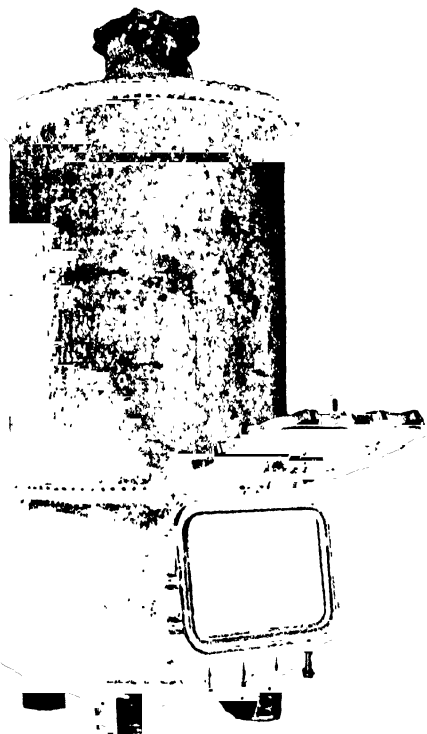


OIL FILTER

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**VERTICAL EXTRACTOR**

Rolled steel, 7 ft. diameter, 16 ft. high. The same design is built in many sizes and of any metal desired to suit liquors handled.

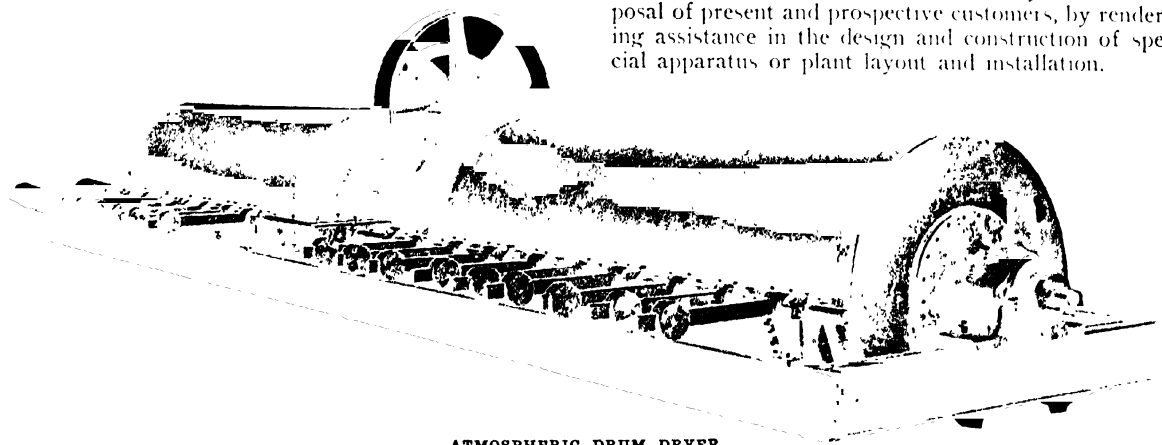


VERTICAL EXTRACTOR

**ATMOSPHERIC DRUM DRYER**

Rolled steel Drums, welded and finished. Also built with cast-iron or cast-steel drum. Sturdy in design, light in weight, economical in maintenance.

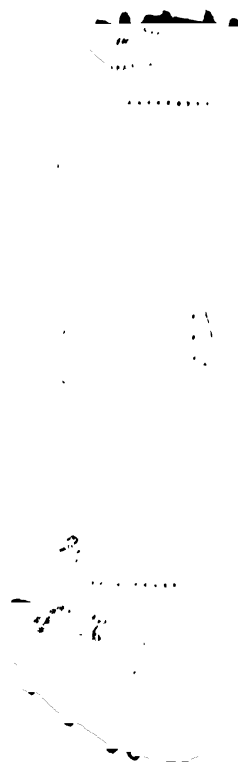
For cooling, solidifying greases, fats, etc., the drum is fitted with brine cooling. This equipment is also built for vacuum operation.



ATMOSPHERIC DRUM DRYER

**EXTRACTOR**

Rolled steel, 6 ft. diameter, 15 ft. high, jacketed throughout. Designed especially for the quick discharge of products after extraction of the solvent. Built in many sizes to meet customers' requirements.



VERTICAL EXTRACTOR

**INQUIRIES SOLICITED**

We are always glad to send drawings and description of our apparatus to Operating Engineers of manufacturing plants, who are interested in more efficient production equipment. We will be glad to cooperate with these men in designing and building special chemical apparatus.

**EXPERIENCE**

The members of our staff have individually had several years' experience in chemical industries and other engineering fields, which is always at the disposal of present and prospective customers, by rendering assistance in the design and construction of special apparatus or plant layout and installation.

# GLENS FALLS MACHINE WORKS

Manufacturers of Rotary Sulphur Burners

GLENS FALLS, N. Y.

## PRODUCTS

Rotary Sulphur Burners for the conversion of Sulphur to Sulphur Dioxide.

Pulp and Paper Mill Machinery: A. D. Wood Pulp Washers, Slushers, Water Filters, Save Alls; Standard Deckers; Standard Wood Pulp Grinders; Moore Rotary Screens; Rotary Pumps; Rogers Wet Machines for automatically converting chemical pulp into sheets 48% dry; Standard Wet Machines; Wells Undulating Knot and Sliver Screens.

## BURNING SULPHUR

Industrial operations requiring the burning of sulphur for acid manufacture, or for  $\text{SO}_2$  gas, depend for their economy on the thorough burning of the sulphur, with consequent elimination of sublimation of unburned sulphur, and the proper control of the combustion in order to prevent conversion to  $\text{SO}_3$ .

The Rotary Sulphur Burner is recognized as the standard machine for the perfect burning of sulphur to  $\text{SO}_2$ .

## ADVANTAGES

Among the advantages derived from the installation of the Rotary Sulphur Burner are,

Exceedingly Low Labor Costs	High Concentration
Ease of temperature control	Clean, White Acid
Uniform strength of Gas	Greater Production
	Maximum Yields
	Minimum Repairs



ONE OF OUR MANY IDEAL INSTALLATIONS

## MECHANICAL DETAILS

The machine consists of a revolving cylinder, the shell being of plate steel. The cone-shaped heads are riveted to the ends of this shell.

**Combustion Chamber**—The Combustion Chamber is either a cast-iron box, or a closed circular steel tank, lined with fire-brick.

Our patented anti-sublimation sleeve set between the conical head and combustion chamber insures proper amount of air for perfect combustion.

**Drive**—Our regular drive consists of a heavy horizontal shaft supported by cast-iron floor stands, equipped with a pair of bevel driving gears and friction clutch, and with pulley sprocket or gear for driving. In addition to this, we are prepared to furnish our spur reducing gear motor drive consisting of cut spur gears, bearing stands, shafting and motor base plate, making entire drive self contained, or our worm reducing gear drive consisting of worm gears running in oil, jack shaft, floor-stands, sprockets, driving chain and flexible coupling for attaching to motor.

**Mechanical Feed**—Our mechanical feed consists of a cast-iron worm running in a large hopper, capacity of which is 500 pounds sulphur. The worm is operated by a chain drive, and a number of various sized sprockets are furnished for regulating speed of worm, that a constant feed may be maintained.

Each burner is also equipped with an additional combination door and adjustable damper, which can be used in place of mechanical feed if desired, or in connection with our steam sulphur melting equipment, which we are prepared to furnish for any capacity.

**Foundation**—No special foundation is necessary. The machine can be placed on an ordinary concrete floor.

## SIZES

The following table will give a combination to suit any requirement.

Capacity ratings for this machine when connected to a chamber set are derived from actual practise with draft of  $\frac{1}{4}$ " to  $\frac{3}{8}$ " water as shown on draft gauge connected to exit pipe near combustion chamber. For contact plants, ratings are with draft of  $\frac{3}{4}$ " to 1" water.

Our "Regular" machines consist of burner proper with trunion shafts and bases, either stand and pulley or friction drive, regular cast iron combustion chamber and mechanical feed.

All combustion chambers of the standard 36" burner size and larger are equipped with our patented anti-sublimation sleeve and expansion flange joint for gas exit pipe.

For extra high consumption of sulphur, where strong draft can be used, we recommend our steel tank combustion chamber, fire brick lined.

Mechanical feed is of our improved patented type and guaranteed not to plug.

For use in connection with chamber sulphuric acid plants, where much conservation of heat is desirable for high concentration, we are in a position to submit several designs of fire brick constructed combustion chambers, also combination fire brick combustion chambers and inter ovens. These are designed to suit the specific requirements of our clients. We will gladly submit plans upon request.

TABLE OF SIZES AND COMBINATIONS WITH RATED CAPACITIES

Size	Capacity for Chambers		Capacity for Contact		Tons of Pulp	Drive, etc
	Hour	Day	Hour	Day		
14"x10"	10 lb	240	20 lb	480		Regular, with spur reducing gear
20"x14"	35 lb	840	50 lb	1200		Regular
20"x8"	65 lb	1560	100 lb	2400		$\frac{1}{2}$ h. p. motor and reducing gear
30"x8"	130 lb	3120	200 lb	4800	15	Regular C I Chamber 36" size combustion chamber
" "	" "	" "	" "	" "	"	6'x10' Steel Tank Chamber
36"x8"	250 lb	6000	350 lb	8400	25	Regular C I Chamber 48" size Combustion Chamber
" "	" "	" "	" "	" "	"	6'x10' Steel Tank Chamber
48"x8"	350 lb	8400	450 lb	10800	35	Regular C I Chamber 6'x10' Steel Tank Chamber
" "	" "	" "	" "	" "	"	7'6"x10' Steel Tank Chamber
48"x10"	400 lb	9600	550 lb	13200	40	Regular C I Chamber 7'6"x10' Steel Tank Chamber
48"x16"	700 lb	16800	900 lb	21600	65	Regular C I Chamber 7'6"x10' Steel Tank Chamber
48"x20"	900 lb	21600	1200 lb	28800	85	Regular C I Chamber 7'6"x10' Steel Tank Chamber

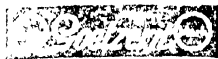
## H. P. Requirements of Rotary Sulphur Burners

14"x10" machine requires	$\frac{3}{4}$ H. P.
20"x14"	$\frac{1}{2}$ H. P.
20"x8"	$\frac{1}{2}$ H. P.
30"x8"	1 H. P.
36"x8"	1 H. P.
48"x8"	1 H. P.
48"x10"	2 H. P.
48"x14"	2 H. P.
48"x16"	2 H. P.
48"x20"	2 H. P.

3 H. P. is sufficient for operating two machines of any of the sizes including 48"x8" size and larger.

# GOETZE GASKET & PACKING COMPANY

Chemical Service Dept.  
NEW BRUNSWICK, N. J.



## PRODUCTS

Goetze Gaskets for chemical service.  
Goetze No. 2 Corrugated Metal and Asbestos.  
Goetze No. 1 Corrugated Metal.  
Goetze Devo Corrugated Metal with Asbestos and Cement.

Goetze Triumph Metal Asbestos.

The above made of Aluminum, Brass, Bronze, Copper, Iron, Lead, or Lead Composition, Monel Metal, Nickel, Silver, Steel, Zinc, etc.

Goetze Valve Gaskets made of a Copper Shell with asbestos filling. Monel Metal or Nickel with filling. Lead or Composition Metal corrugated or solid for chemical service.

"Goetzerit" Sheet Packing.

Goetze Asbestos Chemical Proof Packing.

Goetze Metallic Packings for valve stems, engine, pump and chemical service.

## SIZES AND USE

Goetze Gaskets are made in any size desired from  $\frac{1}{4}$  inch to 25 feet in diameter and larger, in various metals and combinations, for flange and pipe line joints, stills, evaporators, digestors, autoclaves.

## SERVICE

Goetze products are made to conform with the various industrial requirements. Those which we manufacture for the chemical industry as well as for power plant service are made of certain metals and combinations to meet the conditions. Goetze Gaskets have stood the test for years. They have made good under conditions where nothing else would hold.

Alkalies	Condensed water lines
Acid or acidulous conditions	Cylinder heads
Air, ammonia or refrigerating service	Diesel engines
Alcohol and by-products	Flanged joints
Benzol and toluol	Handholes
Fumes and gases	Heaters
Chemical service in general	Locomotives
Coke oven plants	Manholes
Distilleries	Oil engines
Economizers joints	Pumps
Oil conditions, oil refining (hot or cold)	Steam chests
Pumping service	Steam hammers
Boiler service	Steam shovels
Stationary and marine	Steam traps
	Steam and gas engines
	Submarines

Superheaters  
Tractors  
Unions  
Valve bonnets  
Water tube boilers, etc

## GOETZE NO. 2 ELASTIC

Made from heavy copper, steel, monel metal and various other metals deeply and uniformly corrugated and filled with closely twisted asbestos cord, it forms a cushion which takes care of contraction and expansion in pipe lines. The "Comeback" in this gasket is so great that even where the pipe is out of alignment and the flange surfaces are not equidistant the gasket will hold the joint firmly tight and will give excellent service when used again.

## GOETZE VALVE GASKETS OR DISCS

This is a copper valve gasket with an inlay of asbestos, forming a cushion on which the seats of valves of Jenkins and Crane types may close without injury and with the certainty of making a tight valve seat.

While closing tightly, this gasket will not crumble, deteriorate, or injure the valve seat.

They are also made of monel metal or nickel with asbestos filling, as well as Goetze Corrugated Composition Solid Metal type for acid and chemical service. Made in different sizes from  $\frac{1}{4}$  inch up to 12 inch valve.

## GOETZERIT SHEET AND GASKETS

A red asbestos sheet packing, especially recommended for high pressure superheated and saturated steam, air, ammonia, oil and chemical service, etc.

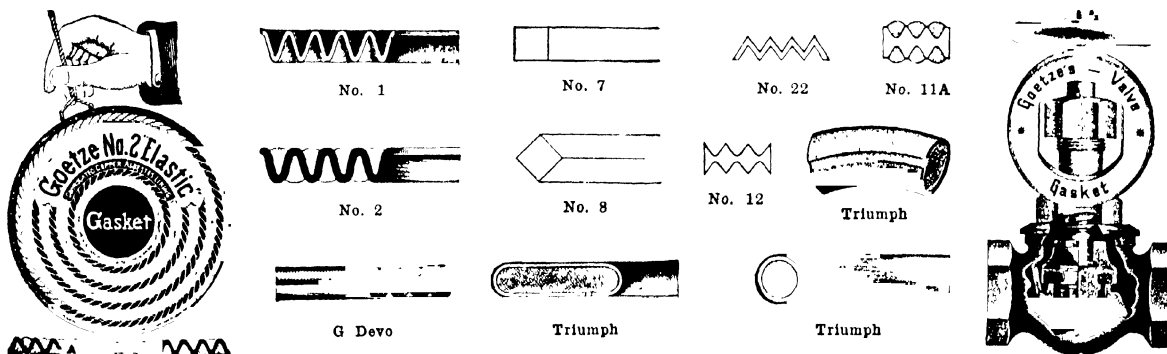
Made of pure, prime asbestos fiber, compressed under exceedingly high pressure, it is chemically treated to render it proof against the destructive action of high pressure, temperature and chemical service.

Goetzerit does not squeeze out into the pipe openings.

Furnished in sheets about 50 inches square, in thicknesses of  $\frac{1}{32}$ ",  $\frac{1}{16}$ " and  $\frac{1}{8}$ ".

## GOETZE CHEMICAL PROOF GASKETS OR PACKINGS

The Goetze Chemical Proof Gaskets or Packings are made of a suitable metal with asbestos or composition filling to make them impervious to the action of chemicals. They are designed to meet every need in the machinery and chemical field to-day.



DETAILS OF SECTIONS, ADJUSTMENT AND APPLICATION OF GOETZE GASKETS AND PACKINGS

# THE GOULDS MANUFACTURING COMPANY



Triplex, Centrifugal, Deep Well, Rotary and Hand Pumps

MAIN OFFICE AND WORKS  
SENECA FALLS, N. Y.

BRANCH OFFICES

New York, 16 Murray St. Philadelphia, 111 North Third St. Chicago, 12 14 South Clinton St.  
Boston, 74 Pearl St. Detroit, 204 Dime Bank Bldg. Pittsburgh, 616 Henry W. Oliver Bldg.  
Atlanta, Citizens & Southern Bank Bldg. Houston, 1001 Carter Bldg.

SALES AGENCIES IN ALL PRINCIPAL CITIES



## PRODUCTS:

Power Pumps Single Cylinder Duplex and Triplex Single- and Double-Acting.

Centrifugal Pumps Single-Stage and Multi-Stage—Horizontal and Vertical.

Vacuum Pumps; Deep Well Pumps; Rotary Pumps; Diaphragm Pumps; Hydraulic Pressure Pumps; Hand Pumps and Pumps for all Special Services such as:

Acid Pumps  
Ammonia Pumps  
Brine Pumps  
Dyehouse Pumps  
Fire Pumps  
Laboratory Pumps  
Molasses Pumps

Oil Pumps  
Sewage Pumps  
Slush Pumps  
Stuff Pumps  
Sugar House Pumps  
Tank Pumps  
Tar Pumps

## POWER:

Our pumps can be furnished for belt, chain, gear or direct drive from engines, turbines, motors, or any other type of driver.

Our line also includes hand pumps of every kind for every service.

## SERVICE:

We are familiar with the great diversity in requirements for pumps in the chemical industries, and consequently our whole selling plan is based on our consulting service to our prospective customers. Tell us your pumping conditions and when these are given we will recommend the best pump for your particular requirements and guarantee it to do the work for which we recommend it.

## SPECIAL PUMPS FOR CHEMICAL PURPOSES:

The parts of Goulds Pumps coming in contact with the liquid being handled will be supplied of a material capable of successfully resisting the liquid, as suggested by our experience.

## SINGLE-ACTING TRIPLEX PLUNGER PUMPS:

Fig. 1696

These pumps are suitable for general water supply, boiler feeding, mine pumping, etc.

They are suitable for use at pressures ranging from 100 lbs. or 231 ft. elevation to 300 lbs. or 603 ft. elevation.

These pumps are very strongly built, exceedingly simple and reliable in operation and can be furnished for any standard form of drive.

For handling viscous liquids these pumps can be furnished with ball valves in all sizes up to and including the 7" x 8"



FIGURE 1696

Single-Acting Triplex Plunger Pump

Capacities ranging from 120 gallons to 21,000 gallons per hour

Type of the 3 1/2" x 4" and smaller sizes  
DATA, SINGLE-ACTING TRIPLEX PLUNGER PUMP

Gals. Displacement per Min	Suc Pump Diam. Ins.	Stroke Ins.	Disp. 1 Rev. of Crank Shaft Gals.	Rev. per Min	Approx. H. P. at Catalog Rating	Suc Pipe Size Ins.	Dis. Pipe Size Ins.	Tight and Loose Pulleys Inches
2	1 1/4	2	0.031	67	.35	3/4	3/4	12 x 1 1/2
4	1 1/4	2 1/2	0.078	52	.64	1	1	12 x 2 1/2
6	2	3	0.122	50	.96	1 1/4	1 1/4	12 x 2 1/2
6	1 3/4	2 1/2	0.078	77	.89	1	1	12 x 2 1/2
9	2	3	0.122	75	1.31	1 1/4	1 1/4	12 x 2 1/2
12	2 1/2	4	0.255	48	1.71	1 1/2	1 1/2	15 x 3
18	2 1/2	4	0.255	71	2.46	1 1/2	1 1/2	15 x 3
18	3	4	0.367	50	2.29	1 1/2	1 1/2	15 x 3
25	3	4	0.367	70	3.07	1 1/2	1 1/2	15 x 3
25	3 1/2	4	0.501	50	3.07	2	2	15 x 3
40	4	6	0.978	42	4.60	2	2	20 x 3
50	4	6	0.978	52	5.65	2	2	20 x 3
60	4	6	0.978	62	6.72	2	2	20 x 3
100	5	8	2.041	50	10.60	3	3	30 x 5
125	5	8	2.041	62	13.00	3	3	30 x 5
125	6	8	2.938	43	13.20	4	4	30 x 6
150	6	8	2.938	52	15.80	4	4	30 x 6
175	6	8	2.938	60	18.30	4	4	30 x 6
175	7	8	4.000	44	19.00	4	4	36 x 6
200	7	8	4.000	50	21.30	4	4	36 x 6
250	7	8	4.000	63	26.00	4	4	36 x 6
250	7	10	5.000	50	26.60	5	5	36 x 6
300	7	10	5.000	60	31.30	5	5	36 x 6
300	8	10	6.520	46	32.00	5	5	42 x 6
350	8	10	6.520	54	36.50	5	5	42 x 6

Ratings Based on Pumping Cold Water  
For high suction lifts, select pumps to run at slow speeds.

## CONSTRUCTION:

Frame and Cylinders—Close grained iron cast in one piece with crosshead guides and cylinders, forming exceptionally rigid construction and accurate alignment of all working parts.

Crank Shaft—High carbon open hearth steel, accurately machined to gauge.

Bearings—Crank shaft and pinion shaft bearings are of babbitt metal.

Gearing—Gear and pinion charcoal iron, machine cut from the solid. A guard covers the pinion and adjacent teeth of the gear. Gear ratio 5 to 1.

Crossheads—Sizes 4 x 6 in. and larger, fitted with adjustable shoes which run in bored guides. Sizes 3 1/2 x 4 in. and smaller; the crossheads are cylindrical in form, and run in bored guides.

Connecting Rods—Sizes 4 x 6 in. and larger, strap head and wedge adjustment with bronze boxes at crank end and bronze bushings at crosshead end. Sizes 3 1/2 x 4 in. and smaller have adjustable boxes babbitted at crank end and bronze bushings at crosshead end.

*Continued on Next Page*



Plungers—Sizes  $2\frac{1}{2} \times 4$  in. and larger are fitted with hard cast iron plungers. Sizes  $2 \times 3$  in. and smaller have bronze plungers accurately machined and ground true and smooth.

Glands—Sizes  $2\frac{1}{2} \times 4$  in. and larger have iron glands. Sizes  $2 \times 3$  in. and smaller have bronze glands.

Base and Valve Boxes—Charcoal iron, in one casting, of liberal proportion, affording large valve area.

Valves— $3 \times 4$  in. and smaller bronze valves.  $3\frac{1}{2} \times 4$  in. and larger—for cold water, rubber discs on bronze grid seats with cylindrically wound springs. For hot water we recommend the grid seat valve with special composition disc.  $3\frac{1}{2} \times 4$  in. and larger furnished with metal valve when ordered, at extra price.

Air Chamber—Supplied with pump. Vacuum chamber to order.

Special Construction—Phosphor Bronze Plungers, Lined Cylinders and Glands, Cloth Pinion, etc., to order.

## DOUBLE-ACTING TRIPLEX PLUNGER PUMPS:

Fig. 1590

These pumps have nearly twice the displacement of a Single-Acting Triplex Pump of the same diameter and stroke. They are designed for 150 lbs. working pressure or 350 ft. elevation.

They are suitable for general water supply, pulp grinders, and other duties where large capacity is required.

In design, materials and workmanship, the pump is of the highest grade and can be furnished for any type of drive.

Frame—Sizes  $10 \times 12$  in. and smaller consist of two standards, held in alignment by center guide bolted between them. The standards are bolted to base, forming a rigid support for the working parts. In sizes  $11 \times 14$  in. and larger, the standards are held together by center cross-head guide and cylinder base bolted between them.

Crank Shaft—High carbon open hearth steel, accurately machined to gauge, and fitted with crank discs at the ends of the crank shaft.

Bearings—Crank shaft bearings are phosphor bronze, the pinion shaft bearings of babbit metal.

Gears—Charcoal iron, machine cut from the solid. Pinion forged steel. Gear guard covers the pinion and adjacent teeth of the gear.

Crossheads—Fitted with adjustable bronze shoes which run in bored guides.

Connecting Rods—Forged steel, fitted at each end with adjustable bronze boxes, marine type.

Cylinders—Separate charcoal iron castings bolted to base, with bronze linings bolted in, easily removable.

Pistons—Iron with followers and fitted with fibrous packing.

Piston Rods—Best quality high carbon steel.

Stuffing Boxes—Bronze on sizes up to and including  $10 \times 12$  inch. Larger sizes bronze fitted. Fibrous packing.

Glands—Bronze, and of easy access for adjustment.

Valve Boxes—Separate charcoal iron castings, each containing a set of suction and discharge valves.

Valves—Rubber discs on bronze grid seats with cylindrically wound springs. Metal valves, as ordered at extra price according to style furnished.

Pipe Connections—At either end of Pump, front or back.

Special Construction—Phosphor Bronze Pistons, Tobin Bronze Piston Rods, etc., to order.

Gals. Displacement per Min.	For Working Pressure	PISTONS		Displacement per Rev. of Crank Shaft	Rev. per Min.	H. P. at Catalog Rating	SIZES OF PIPE		Geared Approx.	Single Pulley for Double Belt
		Diam. Ins.	Stroke Ins.				Suc. Ins.	Dis. Ins.		
600	150 lbs.	8	12	15.25 gals.	40	62.4	8	7	5.6 to 1	
775	150 "	9	12	19.42 "	40	80.5	8	7	5.6 to 1	
950	150 "	10	12	23.88 "	40	98.6	10	8	5.6 to 1	
1275	150 "	11	14	33.75 "	38	142.7	12	10	5 to 1	
1525	150 "	12	14	40.30 "	38	158.6	12	10	5 to 1	

Ratings Based on Pumping Cold Water.

## ROTARY POWER PUMPS:

Fig. 1350

These pumps can be adapted to almost any service within the limits of their capacity and pressure and are especially efficient where the service is intermittent. However, they have been found especially suitable for pumping chemical liquors, food products, milk, vinegar, gasoline, etc. They are also especially adapted to circulating cooling water for various types of equipment and for fire protection.

They are designed for 100 lbs. working pressure or 230 ft. elevation. They can be furnished with pulleys for belt drive or arranged for direct connection to engine or electric motor.

Made in Iron, Bronze Case and Cams, and All Bronze constructions.



Fig. 1350

Rotary Power Pumps

Size Pump	Gals. per Min.	SPEED AND CAPACITY RATINGS							
		PRESSURE POUNDS PER SQUARE INCH							
		30	40	50	60	70	80	90	100
		RPM	RPM	RPM	RPM	RPM	RPM	RPM	RPM
1	25	140	135	141	147	152	155	157	160
	60	288	296	303	307	314	318	327	330
2	50	145	147	150	154	157	160	162	170
	100	276	280	285	289	291	294	296	305
3	75	97	97	97	98	98	100	100	101
	175	226	226	226	228	231	231	234	236
4	150	99	101	101	101	104	104	104	104
	290	165	168	168	168	169	170	170	172
5	175	79	79	79	80	81	82	83	83
	300	142	146	146	147	149	149	149	149
6	275	68	68	68	68	68	68	69	69
	450	111	111	112	112	113	113	114	114

## SIZES

No.	Suction Pipe Inches	Discharge Pipe Inches	Light and Loose Pulleys Inches	Approx. Weight In Lbs.
1	3	1 1/2	1 1/2	325
2	4	2	2	550
3	5	2 1/2	2 1/2	820
4	6	4	2 1/2	1530
5	7	5	2 1/2	1900
6	8	6	2 1/2	2675

†Furnished on pumps for pressures up to 50 lbs. only.

For pressures of 50 to 100 lbs. single tight pulleys will be furnished.

## SINGLE - STAGE, SINGLE - SUCTION CENTRIFUGAL PUMPS:

Fig. 3000

These pumps are very simple in construction and are useful for all services against heads up to 100 ft. The low first cost of installation, few repairs and great durability and flexibility warrant a careful investigation of this type before any installation is made.

It is particularly adapted to handling thick and gritty liquors owing to the large open water passages. It has been found especially useful in by-product coke plants, chemical factories, metallurgical mills, and as a mine pump.

The Standard Single Stage, Single Side Suction, Horizontal Shaft Centrifugal Pump, known as Fig. 3000, is arranged for belt drive by means of a pulley.

Continued on Next Page

In many cases preference is given to direct connected units and, to meet such case, this pump is arranged for direct connection to electric motor, steam engine, steam or hydraulic turbine. Direct connected units are provided with rigid or flexible couplings, as conditions demand. This enables the impeller and the pump shaft to be removed without disturbing the prime mover.

Single-Stage, Single-Suction Centrifugal Pumps

Capacities 1,800 to 252,000 gal. per hr.

### SINGLE-STAGE, DOUBLE-SUCTION CENTRIFUGAL PUMPS:

Fig. 3030

This pump is distinguished from our Single-Stage, Single Suction Centrifugal Pump in that the impeller is of the enclosed type and takes its suction from both sides, instead of from one side only.

Due to the extremely simple construction of this form of pumping apparatus, it has its particular field of utility in which it cannot be replaced by any other type of pumping machinery. With but a single moving element it can be cared for by unskilled labor. There are no valves to get out of order and when driven by an electric motor, the pump can be arranged to operate automatically. This pump is suitable for all services under heads up to 150 ft. but is particularly adapted to handling coke plant by-products, chemical liquors, for circulating hot water in heating systems and for general water supply. Any method of drive can be provided which may be desired.

Single-Stage, Double-Suction Centrifugal Pumps

Capacities 4,800 to 480,000 gals. per hr.

### CONSTRUCTION:

Impeller—Close grained non, accurately machined to a smooth finish. It is of the enclosed type, so designed as to give high efficiency and make it impossible to seriously overload the motive power under any conditions at the specified speed.

Shaft—Special alloy steel, heat treated, accurately machined to gauge.

Stuffing Box—Provided with brass water sealing rings, which prevent air entering the pump.

Casing—Close grained iron, divided horizontally, the two halves bolted together, giving easy access to the interior.

Bearings—Bearings are ring oiling type, mounted in housings bolted to lower half of pump casing. Housings are provided with removable shells, lined with the best genuine babbit which is bored and scraped to fit the shaft.

### AVERAGE MAXIMUM WORKING PRESSURE 65 POUNDS OR 150 FEET TOTAL HEAD RATINGS BASED ON PUMPING COLD WATER

Pump No.	Pipe Sizes		Average Capacity,*		Standard Pumps		Maximum Pumps		Approximate Shipping Weights, Pounds
	Dis. In.	Suc. In.	Min.	Max.	Dis. In.	Exc. In.	Dis. In.	Exc. In.	
28	2	1 1/2	80	200	3	5	5	7	300
21	2	1 1/2	100	250	3	6	6	10	500
25	3	2	150	300	3	6	6	10	600
31	3	2	200	400	4	7	6	14	900
43	4	3	300	600	4	7	7	14	900
41	4	3	400	800	4	8	8	18	1150
57	5	4	600	1200	5	8	8	16	1100
51	5	4	800	1600	5	10	8	20	1650
68	6	5	1000	2000	6	10	8	20	1600
61	6	5	1200	2400	6	11	8	26	2000
88	8	6	1500	3000	8	14	12	24	2200
81	8	6	2000	4000	8	16	14	30	2700
105	10	8	2500	5000	10	16	16	30	3200
101	10	8	3000	6000	10	18	18	34	4000
128	12	10	4000	8000	12	20	20	40	4500
16	16	12	5000	10000	16	24	24	44	7000

\*Maximum capacities can be obtained only when Head is greater than 50 feet.

†Weight includes pump, extended iron bedplate and flexible coupling for direct connected motor, engine or turbine, or pump mounted upon bedplate and fitted for belt drive including antifriction bearings. Weight of driver is not included in the above.

Full information covering head, power, efficiency, speed, etc., can be obtained from the nearest office or agent of The Goulds Manufacturing Company.

Note—Brass fitted construction should always be used when pump is desired for pumping hot water.

### MULTI-STAGE CENTRIFUGAL PUMPS:

Fig. 3300

These pumps are excellent for all classes of installations where a centrifugal pump can be used and where the head is greater than can be efficiently generated in a single stage. They can be supplied in any number of stages up to six and for heads up to 580 ft.

They are primarily designed for direct connection to electric motors or steam turbines, as this is the field of their best adaptability. They can, however, be arranged for belt drive where conditions require.

These pumps are particularly suitable for general water supply, hot water circulating, boiler feeding, mine service, hydraulic pressure, pumping brine, acids, chemical liquors, etc.



Multi-Stage Centrifugal Pumps

Construction—These pumps embody all the latest features, the value of which experience has fully demonstrated. Where the size of the pump is permitted, the casing is horizontally divided with the suction and discharge nozzles cast upon the lower half of the casing. The small sizes have vertically divided casings of the sectional type held together by horizontal bolts.

The larger pumps can be furnished in from two to five stages. The small sizes can be built up to six stages.

Pump Number	PIPE SIZES		Range of Capacity Gallons per Minute	Maximum Head
	Discharge Inches	Suction Inches		
28	2	1 1/2	50-100	250 lbs or 350 feet
21	2	1 1/2	50-100	
3	3	2	100-200	
4	4	3	175-325	
5	5	4	250-700	
6	6	5	600-1200	
8	8	6	1000-1500	

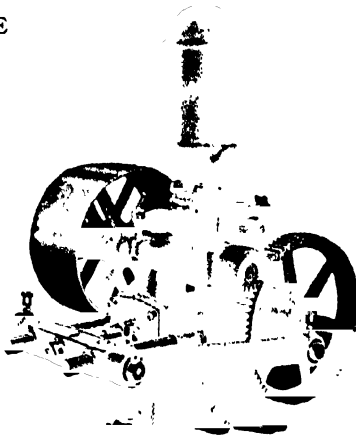
Ratings Based on Pumping Clear Cold Water

Continued on Next Page

### GOULDS DOUBLE ACTING "PYRAMID" PUMP:

Fig. 1531

For pumping of almost any kind up to 75 lbs. pressure or 175 ft. head. Especially useful for tank pumping, for water supply for small plants, for pumping light oils, gasoline, benzol, etc. Can be used with any form of drive. Capacities from 6 to 114 G. P. M.



### GOULDS DOUBLE-ACTING PISTON VACUUM PUMP:

Fig. 1049

Designed for use in connection with evaporators, vacuum pans, vacuum dryers, surface condensers, stills, etc. Arranged for any form of drive. No priming is necessary as both ends of cylinder are always submerged. We have several other types of vacuum pumps for special services.

Cast iron frame, open heart steel crank shaft, charcoal iron cylinder, bronze piston, valves, rubber discs on bronze grid seats, with cylindrically wound springs. Pipe connections—suction at top and one side of cylinder, discharge at other side.

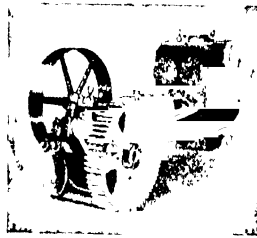


Fig. 1049 Goulds Vacuum Pump

#### DIMENSIONS AND DISPLACEMENTS

Gallons per Minute	Pistons		Displacement 1 Rev. of Crank Shaft	R P M	SIZES OF PIPE		Geared	Single Pulley Inches
	Diameter Inches	Stroke Inches			Suction Inches	Discharge Inches		
170	8	10	4.28 cu. ft.	40	5	5	4 to 1	30 x 4
265	10	10	6.73 "	40	5	5	4 to 1	30 x 5
385	12	10	9.72 "	40	5	5	4 to 1	30 x 5
525	14	10	13.22 "	40	6	6	4 to 1	30 x 5
700	14	14	18.51 "	38	6	6	4 to 1	36 x 6
1000	16	16	27.62 "	37	8	8	1 to 1	36 x 6
1450	18	18	39.31 "	35	10	10	1 to 1	42 x 8

### GOULDS SINGLE-ACTING TRIPLEX PLUNGER STUFF PUMP:

Fig. 1128

This is a ball valve pump especially suited to pumping thick, heavy liquids, wood pulp and stuff in paper mills, sizing in textile mills, for tar flushing in by-product coke plants, etc. Good for 65 lbs. pressure or 150 feet elevation.

Built to stand constant hard work. Charcoal iron cylinders and valve boxes, phosphor bronze plungers, bronze balls and valve seats, frame strong and rigid.



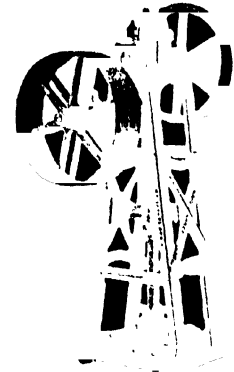
Dry Capacity in 24 hours at 10 R P M	PLUNGERS			Capacity 1 Revolution of Crank Shaft	SIZES OF PIPE		Geared	Single Pulley Inches
	Diameter Inches	Stroke Inches	Working Pressure		Suction Inches	Discharge Inches		
42 tons	8	12	65 lbs.	7.83 cu. ft.	7	7	5 to 1	30 x 6
53 "	9	12	65 "	9.91 "	8	8	5 to 1	30 x 8
66 "	10	12	65 "	12.24 "	8	8	5 to 1	30 x 10
95 "	12	12	65 "	17.62 "	10	10	5 to 1	30 x 12

### GOULDS DIFFERENTIAL POWER WORKING HEAD:

Fig. 1030

For operating single- and double-acting deep well cylinders. Direct connected or belt drive. For heads up to 500 ft. and capacities to 1257 G. P. M.

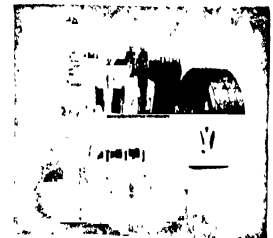
We design and supply complete outfits for deep well pumping of every description.



Stroke Inches	Max. Size of Pipe		Geared	Pulley Tight and Loose Inches	Approximate Weight in Lbs.
	Suction Inches	Discharge Inches			
10	6	3	4 to 1	24 x 4	750
16	6	3	5 to 1	30 x 4	1150
24	6	3	5 to 1	36 x 5	2650



Goulds Fig. 1223 Diaphragm Suction Pump



Goulds Fig. 1671 Triplex Pressure Pump

For handling slimes and other semi-fluids in cyanide mills, muddy and gritty water, sewage, etc. Simplest pump for above services. Can be fitted with pump jack adapting it for engine drive.

For pressure service in oil refineries, cotton oil mills, sugar and glucose refineries, steel works, service in connection with filter and hydraulic presses, etc. For pressures up to 7500 lbs., wide range of capacities.

#### BULLETINS:

The following bulletins, any of which will be sent on request, give complete specifications on the various standard types of Goulds Power Pumps.

- No. 100 Double Acting, Single Cylinder Piston Pumps.
- No. 101 Single-Acting Triplex Plunger Pumps, Outside-Geared Type.
- No. 103 Single-Acting Triplex Plunger Pumps, Large Capacity and High Pressure Type.
- No. 104 Double-Acting Triplex Piston Pumps, Vertical Type.
- No. 105 Single-Stage, Single Side Suction Centrifugal Pumps.
- No. 106 Vacuum and Stuff Pumps.
- No. 107 Deep Well Triplex Pumps.
- No. 108 Deep Well Working Heads and Cylinders.
- No. 109 Portable Mine Pumps.
- No. 110 Single-Stage, Double-Suction Centrifugal Pumps.
- No. 111 Centrifugal Sump Pumps.
- No. 112 Handy Data on Power Pumping.
- No. 113 Power Rotary Pumps.
- No. 114 Vertical Single Stage Centrifugal Pumps.
- No. 115 Double-Acting Triplex Plunger Pumps, Horizontal Type.
- No. 116 Single-Acting Triplex Pressure Pumps.
- No. 118 Centrifugal Fire Pump.
- No. 119 Single Stage, Single Suction Centrifugal Pumps, Enclosed Impeller Type.
- No. 120 Multi-Stage Centrifugal Pumps for General Service.
- No. 122 Centrifugal Pump Sales Service Data.
- No. 123 Goulds-Lee Turbo Pump Units.

# GRINNELL COMPANY, INC.

Manufacturers of Fire Protection Systems, Heating,  
Industrial, Process and Power Plant Piping

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PROVIDENCE, RHODE ISLAND

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Los Angeles, Calif. San Francisco, Calif. Seattle, Wash.

## GRINNELL COMPANY OF CANADA, LTD.

Montreal, Que. (Plant) Toronto, Ont. (Plant) Vancouver, B. C. Halifax, N. S.

## PRODUCTS AND SERVICES

Complete Engineering and construction service in  
the design and installation of:

- Automatic Sprinkler Systems
- Steam, Hot Water and Gas Heating
- Power and Related Piping
- Pipe Bending, Threading, Fabricating and Welding
- Fittings, Pipe and Valves
- Process Piping and Piping for Acids, Alkalies and  
other Special Materials
- Compressed Air Lines and Cleaning Systems
- Hydraulic Piping
- Water Supply Systems
- Gordon Dryers, Humidifiers
- Safety Fuel Savers
- Constant Level Size Circulating Systems
- Spray Cooling Systems

## THE GRINNELL AUTOMATIC SPRINKLER SYSTEM

This system has been in successful operation for more than 30 years. Today over 20,000,000 Grinnell sprinkler heads are safeguarding business property valued at approximately three billion dollars. The average loss per fire in Grinnell protected buildings in over 20,000 recorded fires is less than \$300—a reduction of over 96% on the lowest average fire loss previous to the invention of this system.



GRINNELL HEAD  
WITH SPECIAL GLASS CAP  
TO PREVENT CORROSION

**Operation**—When fire breaks out, temperature at the ceiling rapidly increases and causes the fusible strut of the sprinkler head to melt. Thereupon, the glass valve, found only in the Grinnell head, is thrown from its seat on the unique flexible diaphragm. This allows the water to rush out and strike the deflector,

which breaks it into a heavy spray. One sprinkler head effectively drenches an area of 80 to 100 square feet.

The operation of the sprinkler head immediately and automatically gives the fire alarm.

**Installation**—The Grinnell Automatic Sprinkler Systems are factory-assembled to blueprints, fittings being made-on as far as possible by machinery. The result is that the equipment comes to the job ready for quick and botherless installation by our erecting crews. This reduces interference with usual plant operation to a minimum. Each individual system is scientifically designed to secure the utmost protection, at the same time taking fullest advantage of water supply sources and plant arrangement to gain all possible economy in the layout of the system. Our long experience in this work enables us to insure satisfactory service even under the most difficult conditions.

**For Chemical Plants**—The Grinnell Automatic Sprinkler is particularly adapted for use in Chemical Plants and many installations are in successful operation in plants erected under contract with the U. S. Government, as well as in privately owned plants all over the United States, Canada and abroad. The reason for success is the same as given above, viz.: that all Grinnell installations are specially planned for particular conditions and requirements, not simply following cut-and-dried rules and standards.

**Corrosion**—In Chemical Plants where fumes and corrosive vapors are more than ordinarily severe, we can install a glass-capped Grinnell sprinkler head which effectively safeguards working parts from becoming inoperative. The glass cap in no wise interferes with the prompt and efficient operation of the sprinkler itself. Under especially severe conditions of corrosion, we advise the coating of all sprinkler-pipes with our acid-resisting and corrosion-proof Bitumastic Enamel.

**Grinnell Dry Pipe System**—Special care is taken to prevent freezing of pipes and connections in exposed

*Continued on Next Page*

locations. For conditions where freezing temperature is likely to be experienced, we install the Grinnell Dry Pipe System, in which the pipes are normally empty until the opening of a sprinkler head automatically sets the system in operation. We have now further quickened and improved this system by the invention of the Grinnell Dry Valve Accelerator.

**Inspection and Service**—Within the past year this company has instituted a new department whose sole duty it is to inspect Grinnell Sprinkler equipments and render full reports to the owners on such inspections with practical suggestions for needed changes. A competent corps of expert sprinkler engineers are engaged in this work and the success which has already attended it is ample evidence of the necessity of this independent inspection service. It is our sole aim in this inspection work to continually keep Grinnell equipments in the same first class operative condition that they were when originally installed. For that reason this service is rendered on a low yearly fee basis which is practically cost to us.

**Designs and Estimates**—Inquiries addressed to our head office or to any of our branches will immediately receive the attention of our engineering staff, who will promptly furnish any information, designs or estimates required.

#### GRINNELL INDUSTRIAL PIPING

**Evils of Poorly Designed Piping**—Present high costs of coal and other supplies necessary to the operation of all kinds of power and heating plants, and the great advance in wages, make efficient and economical performance absolutely necessary. Plant owners must positively stop costly waste, hitherto regarded as unavoidable, and see to it that every unit is producing its maximum capacity at minimum cost.

High grade machinery, if served by poorly designed and indifferently installed piping, does not produce the expected results. This condition is frequently brought about either by too small a pipe line, producing a great drop in pressure at the discharge end; by lines with too many short turns; by heaters and other pipe lines so large that the low velocity of flow induces excessive condensation and heat loss; or by too many parallel lines serving the same or similar purposes.

**Lack of Flexibility**—Too frequently an otherwise good arrangement is spoiled by insufficient flexibility, resulting in overstrained joints due to expansion and contraction. This condition inevitably means great expense for maintaining pipe joints and keeping the line in good repair, and imposes a great injustice on the operative, who must spend his Sundays or leisure hours doing a job which proper design would have rendered unnecessary.

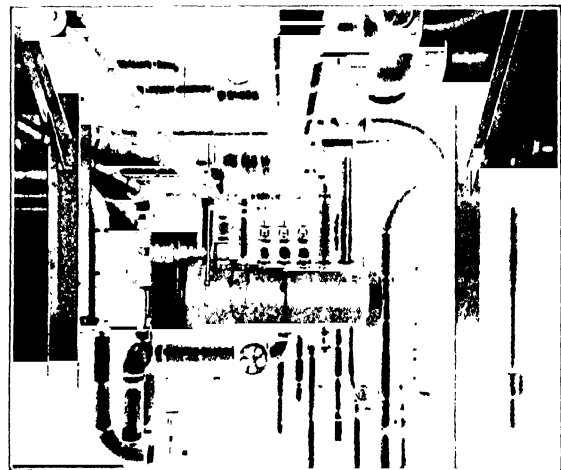
**Poor Drainage**—Considerable annoyance and expense is caused by piping which becomes pocketed,

due to poorly designed hangers or indifferent workmanship, preventing proper drainage. Where low points in steam or exhaust piping systems are necessary, great care should be taken to provide proper means of automatically draining these points without depending on draining by hand.

**Insulation**—The question of the advisability of the use of insulation as a means of preventing heat loss is necessarily one to be determined by the engineers designing the piping. Great waste may be avoided by the installation of the proper type of insulating materials, applied to lines where the heat loss can not be used to good advantage for heating purposes. Too often pipe lines and other hot surfaces are not properly insulated. In many cases, however, insulation is used to correct faulty design of pipe sizes, whereas, if proper circulation could have been maintained by properly equalizing the pipe sizes, the bare surface of the pipe could be used as a very efficient heating surface in place of an equal or greater amount of radiation.

#### Improvements Effected by Grinnell Piping System

**—Correct Pipe Sizes**—The size of pipe to be used in the designing of all Grinnell piping systems is determined by weighing carefully the two prime factors of **first cost** and **frictional resistance**. There is obviously a correct size of pipe to be used in the case of every pipe line, and this size will be the economical size, both from the standpoint of first cost and the standpoint of frictional resistance caused. The frictional resistance means the power consumed in the transmission of the liquid or vapor. In Grinnell designed systems these resistances are carefully calculated to give equalization of flow to all apparatus. In the calculation of these resistances, our engineers determine where it is advisable to use long radius bends and necessarily guard against the use of globe type valves where resistance is an important factor.



EVERY DETAIL PLANNED AND EXECUTED BY GRINNELL COMPANY

*Continued on Next Page*

**Long Radius Bends**—Short turn screwed fittings and ordinary globe cut out valves, used in important pipe lines in many plants, cause great loss of pressure due to the sharp turns which result. Globe valves for cut out purposes should be displaced by straight way gate valves and long radius bends used in place of short turn elbows. These bends offer no more resistance to the flow than an equal length of straight pipe, and the distance is actually less than when straight pipe is used with elbows. Long radius bends are almost invariably employed in Grinnell piping systems where it is necessary to provide for expansion and contraction of piping. They are also used in lines where resistance is a prime factor, to cut down the friction caused by ordinary fittings.

**Automatic Non-return Valves**—These should be used in the steam branches from boilers to the header in every installation of two or more boilers. This type offers a greater protection to the boiler and to the employee than any other form of valve.

**Elimination of Overloads**—Many overloaded reciprocating engines are now "wire drawing" and straining at their tasks because of long, small pipe lines. They could easily carry the load if large receiver type separators were placed on the throttles. This permits the receiver to become filled with steam at boiler pressure while the engine admission valve is closed, and provides a great volume of full pressure steam ready to enter the cylinder the instant the valve opens.

**Utilization of Waste Hot Water**—Incalculable loss is incurred every day by permitting hot water waste from heating systems, slushers, drying machines, dry kilns and other steam consuming machines. Both the

water and the valuable heat it contains should be recovered and returned directly to the boiler.

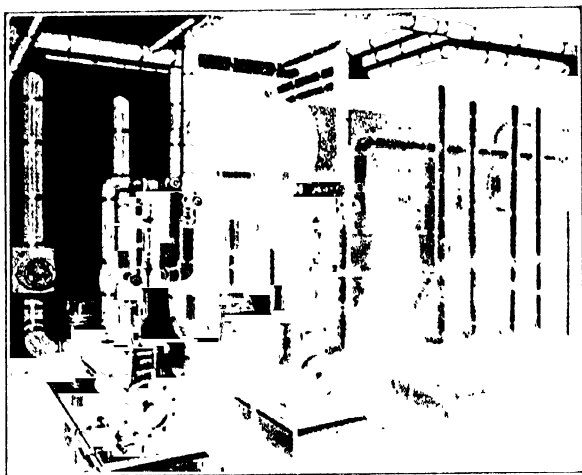
**Savings Under Grinnell Systems**—The installation of modern piping systems and appliances produces an immediate saving in coal consumption. In many cases such savings have paid the entire cost of the improvements in a few years.

Many years of experience in widely varying types of plants have qualified us to undertake these improvements with an efficiently organized corps of engineers, all specialists in one or another of the several branches. We will cheerfully send an expert to any plant to survey and estimate the cost of such changes.

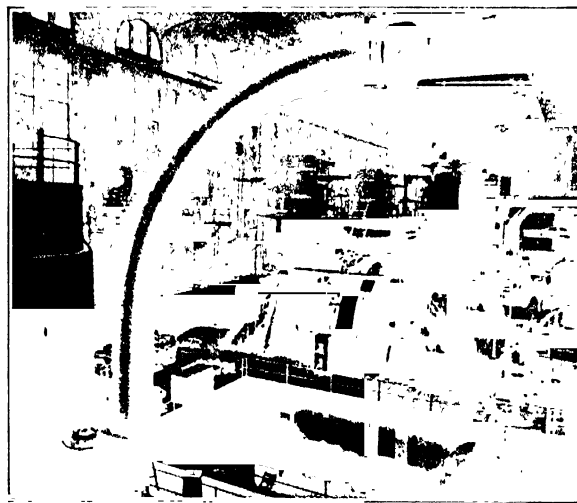
**Flexibility and Simplicity of Grinnell Systems**—The necessity for flexibility in power plant design can not be too strongly emphasized. The piping systems must be laid out, and the valves so arranged that the operating engineer can, at will, cut out one or more boilers, engines, or other steam-using machines, for repairs or renewals, replacing them with standby machines which, unless the piping system is properly planned, may be found useless in time of need.

While it is desirable that an adequate number of valves, etc., be provided, it is equally necessary that they be kept down to the least number commensurate with efficiency and safety. Long circuitous lines should be made as direct as practicable and proper expansion bends provided on rigid lines to allow for the absorption of expansion and contraction.

Simplicity in piping is of the utmost importance in order to keep first cost within reasonable limits, to insure economical operation and reduce upkeep.



A TYPICAL GRINNELL PIPING INSTALLATION



A GOOD EXAMPLE OF GRINNELL PIPE BENDING

*Continued on Next Page*

### PIPING FOR CHEMICAL PLANTS AND OTHER SPECIAL PURPOSES

Not only is Grinnell Company, Inc., skilled in designing efficient steam or water lines for ordinary purposes, but furnishes and installs all piping required in processing plants, or plants which involve the use or treatment of acids and alkalis.

We furnish pipe made of steel, cast iron, genuine wrought iron, and spiral riveted pipe, black and galvanized. We also furnish brass, copper, and aluminum pipe, pipe that is lined with various metals or alloys, and specially treated acid resisting pipes, with suitable valves and fittings for all the above classes of materials.

Gaskets, packings, and specially designed joints will be provided as each specific condition requires.

Acting under the direction of the chemical engineer, or some other qualified attache of the plant, Grinnell Co., Inc., will cheerfully submit proposals for piping equipment for pulp and paper mills, sugar refineries, soap factories, fertilizer works, bleacheries, dyeing plants, phosphate works, cement mills, gas plants, oil refineries, cotton oil mills, etc.

### CONSTANT LEVEL CIRCULATING SIZE SYSTEM

This system is simple in design and operation, economical in cost and manipulation, and it satisfactorily maintains circulation, uniform temperature and level. It is splendidly adapted to the conditioning of the finest or coarsest yarns, and improves the quality and increases the output of any textile factory. We are prepared to furnish and install complete outfits of

design and material best suited to individual needs and conditions.

### SPRAY COOLING SYSTEMS

Where only a limited quantity of water is available for cooling purposes, a spray system can be arranged over any small reservoir or pond and the warm condensing water, quickly cooled to a temperature several degrees below that of the atmosphere, can be used and cooled over and over again at low cost.

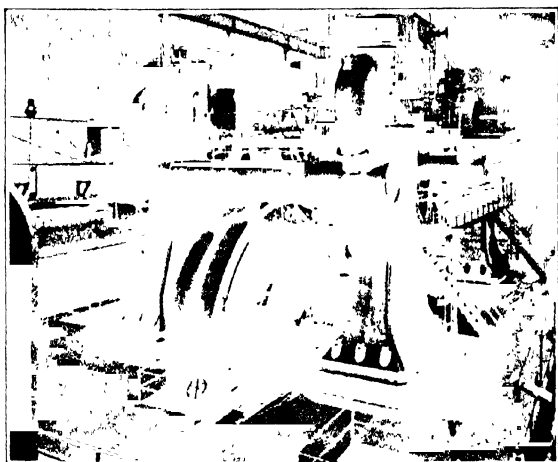
When the plant does not possess a pond of water, a suitable reservoir may be built or a shallow tank constructed on the roof of a building and the system installed there. Such a system is simple in design, inexpensive in cost and economically replaces the unsightly, inefficient cooling tower.

### HUMIDIFYING SYSTEMS

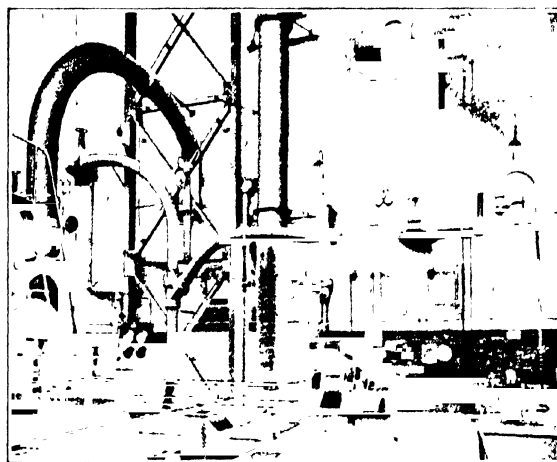
Through our affiliations with American Moistening Company, we are in a position to design and install complete humidifying systems, using devices long standard in this work. An especially reliable and sensitive control is a feature of all American Moistening Company equipments, which include sectional, fan type, high duty, and ventilating humidifiers; atomizer or compressed air systems; air conditioning room equipment, etc.

### COMPRESSED AIR CLEANING SYSTEMS

All textile and many other plants suffer from the accumulation of lint and dust on inaccessible parts of the machinery. The installation of a small air compressor, with a simple piping system with hose connections conveniently located, permits the thorough cleaning of all machinery.



CROSS-COMPOUND PIPING INSTALLED BY GRINNELL COMPANY



GRINNELL HIGH PRESSURE PIPING IN A CENTRAL STATION

*Continued on Next Page*

Each air hose, 50 to 60 ft. in length, is provided with a lever valve nozzle at one end and a quick motion coupling at the other end. The patented quick motion coupling with which the hose and every station is equipped makes possible very quick changes from station to station. A few operators can quickly and thoroughly clean an entire mill.

### GRINNELL HEATING SYSTEMS

Many complaints of inefficient heating arise from improperly designed or unsuitable heating systems. The whole subject of economical heating should be approached from a purely scientific standpoint, covering not only the cubic contents of the building but also its structural details and the suitability of one or another heating system to the particular building under consideration.

It is by careful pre-consideration of all these elements that Grinnell heating engineers are able to install a system that not only produces the required degrees of heat but does so on a minimum coal consumption.

For many mills and other industrial plants the Grinnell system of semi-automatic temperature control will provide ample heat, graduated to meet internal conditions, and regardless of outdoor temperature, at a far lower cost per unit than any other system.

**Remodeling Old Heating Plants**—Heating plants often give unsatisfactory results due to poor design or repeated radiation additions without proper increase in the capacity of the piping. Natural de-

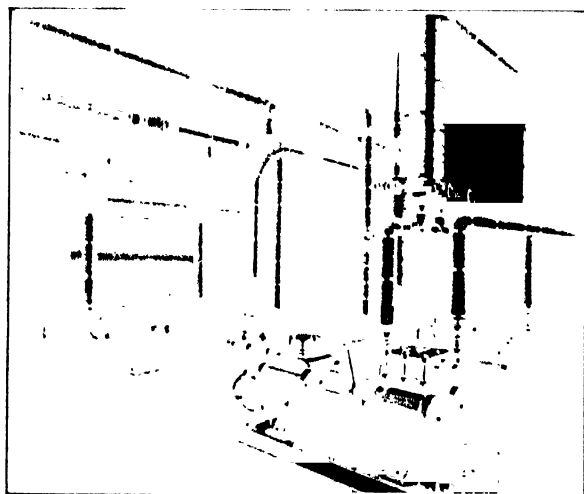
terioration of the system also causes low efficiency. We are in an excellent position to remodel such plants and put them in perfect working condition.

When factory buildings are increased in length a change in the method of heating is often made necessary. A careful study and analysis of every such case will be made by an expert heating engineer. Old systems, apparently obsolete and practically worthless, may be brought up to a state of high efficiency under such skilled remodeling, thereby saving many thousands of dollars.

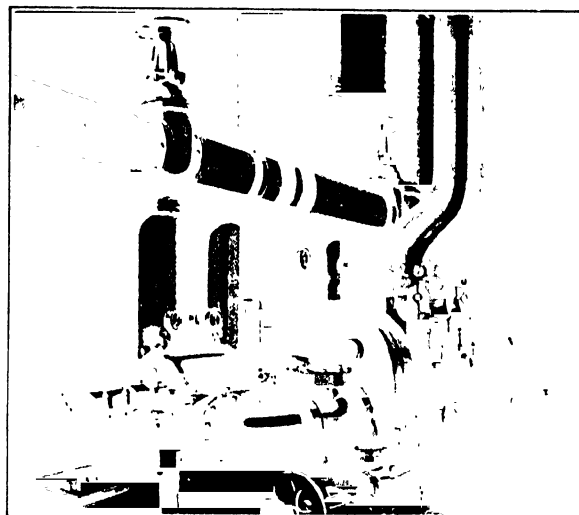
The highly trained corps of specialized piping engineers maintained by Grinnell Company, Inc., and its experienced construction department, insure proper design as well as satisfactory installation and operation. The plant owner or his designing engineer will receive capable and ready cooperation from these experts in the development of his plant.

### STEAM POWER PLANTS

Our Engineering Department is fully qualified to design complete piping systems for power plants serving chemical plants, electric lighting plants, electric power plants, water works, steel rolling mills, blast furnaces, copper mines, saw mills, oil mills, pulp and paper mills, tanneries, bleacheries, dyeing plants, water filter plants, phosphate mines, fertilizer factories, or any others of similar nature. We are prepared to furnish or fabricate in our shops all equipment and material required, erecting same in the most approved manner.



FEED PIPING INSTALLATION BY GRINNELL COMPANY



GRINNELL HIGH PRESSURE POWER PIPING IN POWER HOUSE OF THE RHODE ISLAND COMPANY



# GRIEBEL INSTRUMENT COMPANY, INC.

CARBONDALE, PA.

## PRODUCTS

Precision Volumetric Glassware, Chemical Laboratory Glassware, Scientific Glass Apparatus, Precision Thermometers and Hydrometers, with or without Bureau of Standards Certificates.

## SPECIALTIES

Acid Drip Cups

Beakers

Insol

Nonsol

Pyrex

Burettes

Calcium Chloride Tubes

Cylinders

Dropping Bottles

Extractors

Filter Paper

Funnels, Bunsen, with long thin stems

Gas Apparatus

Gas Bottles

Gas Burettes

Gas Pipettes

Hydrometers for every Industry

Plain

Combination

Kipp's Gas Generators

Pipettes

Rubber Stoppers and Tubing

Separatory Funnels

Specific Gravity Bottles

Thermometers

With paper or milk glass scale

Straight or angle

Thermometers, Beckman's

Thermometers, engraved on stem

## GLASS BLOWING SERVICE

We have one of the best equipped glass blowing shops in the country employing only the best of skilled glass blowers and engravers. With these facilities we are fully prepared to make any special glass apparatus, no matter how delicate or intricate, according to sketches and specifications.

When you consider that we have been supplying, for several years, some of the largest users of laboratory glassware and supplies, you can feel assured that any glass blowing commission awarded us will be carefully and most satisfactorily fulfilled.

## PRECISION VOLUMETRIC GLASSWARE

All of our Precision Volumetric Glassware is produced strictly in accordance with the specifications of the U. S. Bureau of Standards, and graduated by weighing at 20°C.

**Flasks**—Volumetric to meet the Specification of the U. S. Bureau of Standards, Washington, D. C., with-out Control Stamp offered.

With our unofficial factory certificate

Without Stopper or with Glass Stopper

Capacity cc. 50 100 200 250 500 1000 2000

With certificate from the U. S. Bureau of Standards Without Stopper or with Glass Stopper

Capacity cc. 50 100 200 250 500 1000 2000

**Cylinders**—Precision, graduated by weighing at 20°C in accordance with the Specification of the U. S. Bureau of Standards, Washington, D. C., with unofficial factory certificate

Capacity cc. 10 25 50 100 250 500 1000 2000

Graduated in 1-10 1 5 1 2 1 5 5 10 25

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**Burettes**—Precision, graduating by weighing at 20°C in accordance with the specification of the U. S. Bureau of Standards, Washington, D. C., with individual control number, time of outflow, all around graduations for the whole centimeters and semicircular graduation for the fractions. Offered with our unofficial factory certificate

With Pinchcock, Geisler Stopcock, Fresenius Stopcock or Three-way Stopcock

Also furnished with certificate from the U. S. Bureau of Standards.

Capacity cc. 10 25 50 100

Sub-divisions 1-20 1-10 1-10 1-5

**Pipettes**—Precision, Volumetric, Normal. Graduated to meet the requirements of the U. S. Bureau of Standards. Without control stamp, with unofficial factory certificate. Also with control stamp

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Mohrs, Precision. With unofficial factory certificate. Also with control stamp.

Capacity cc. 1 1 2 2 5 10 25 50

Graduated in 1-100 1-10 1-50 1-10 1-10 1-10 1-10 1-5

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Without or with certificate.

# GROEN MFG. CO., INC.

Established 1905

Coppersmiths

4529-37 ARMITAGE AVE., CHICAGO, U. S. A.

## PRODUCTS

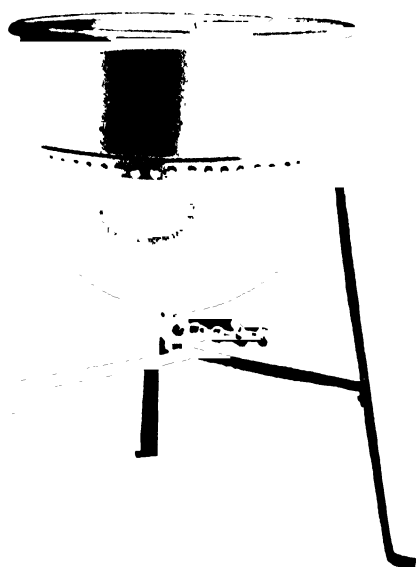
All kinds of Copper, Aluminum, Monel Metal and Steel Equipment for Chemical and Allied Industries.

Coils of any description	Agitator Kettles
Condensers	Vacuum Pans
Distilling Apparatus	Expansion Joints
Extracting Apparatus	Evaporators
Dye House Apparatus	Pipe Bends or Shapes
Tanks	Revolving Pans
Heaters	Tin Lined Equipment
Coolers	Milk Condensing Pans
Jacketed Kettles	Acid Plants
Candy Kettles	Vinegar and Yeast Plant
Varnish Kettles	Equipment
Varnish Kettle Trucks	Spun or Drawn Products
	Castings in Brass, Bronze or Aluminum

## FACILITIES

We have an excellent equipped shop capable of handling the largest class of equipment, also of turning out production work of smaller sizes.

To illustrate our varied equipment we have facilities to spin 3/16" metal up to 60" diameter. Weld or braze any metals by acetylene gas or fire. Bend pipe up to 14" in diameter. A power hammer capable of hammering 15' diameter shapes, and move all materials by traveling hoists.



THESE COPPER STEAM JACKETED KETTLES 5 TO 75 GALLON ARE CARRIED IN STOCK

## SERVICE

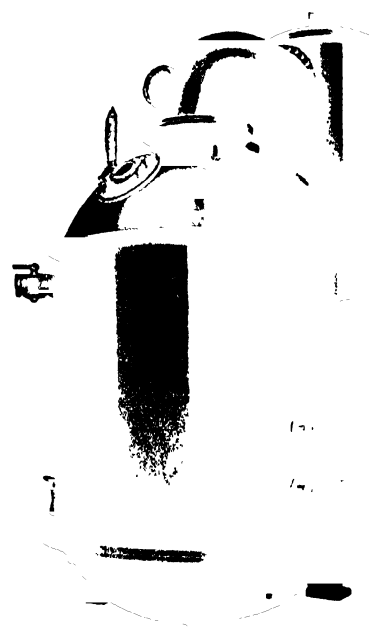
At all times we guarantee to make delivery as specified, and assure prompt replies to inquiries. Our very wide experience on all classes of equipment at times may be very beneficial to your engineers, and it is given with pleasure, binding yourselves under no obligation whatever.

## GUARANTEE

We guarantee all materials to be as specified and will replace any proving defective. Workmanship and finish at all times to be first class.

## ESTIMATES

Estimates are always cheerfully given from drawings or specifications of special apparatus or materials, if these are not available a rough pencil drawing stating purpose and sizes is sufficient, but before proceeding with manufacture we would submit detailed drawing made by our engineering department for your approval.



THIS VACUUM PAN IS USED VERY EXTENSIVELY IN MILK CONDENSING PLANTS, AND CAN BE SUCCESSFULLY USED ON ANY LIQUID

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CARBONDALE, PA.

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Precision Volumetric Glassware, Chemical Laboratory Glassware, Scientific Glass Apparatus, Precision Thermometers and Hydrometers, with or without Bureau of Standards Certificates.

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Nonsol

Pyrex

Burettes

Calcium Chloride Tubes

Cylinders

Dropping Bottles

Extractors

Filter Paper

Funnels, Bunsen, with long thin stems

Gas Apparatus

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Hydrometers for every Industry

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Kipp's Gas Generators

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With our unofficial factory certificate

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With certificate from the U. S. Bureau of Standards Without Stopper or with Glass Stopper

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Also furnished with certificate from the U. S. Bureau of Standards.

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Without or with certificate.

# GUARANTEE CONSTRUCTION COMPANY

Consulting, Designing and Contracting Engineers

112 CEDAR STREET, NEW YORK, N. Y.

## PRODUCTS AND SERVICES

Complete design, construction and equipment of chemical plants, structures of steel, timber and reenforced concrete, labor saving equipment, conveyors and storage systems.

## THE AIRVEYOR

An improved, patented pneumatic conveying system for handling granular and pulverized materials, dustless, noiseless and safe.



"PULLING IT OUT AT 30 TONS PER HOUR"

The Airveyor handles practically any material which can be conveyed in closed ducts. Illustration below shows Airveyor unloading cargo of Copra at 40 tons per hour.



UNLOADING CARGO OF COPRA AT THE RATE OF 40 TONS PER HOUR



UNLOADING SODA ASH WITHOUT DUST

The Airveyor solves the problem of unloading finely pulverized materials such as lime or soda ash. Note the absence of dust in the car of soda ash while the Airveyor is operating.

*Continued on Next Page*

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UNLOADING CARGO OF COPRA AT THE RATE OF 40 TONS PER HOUR



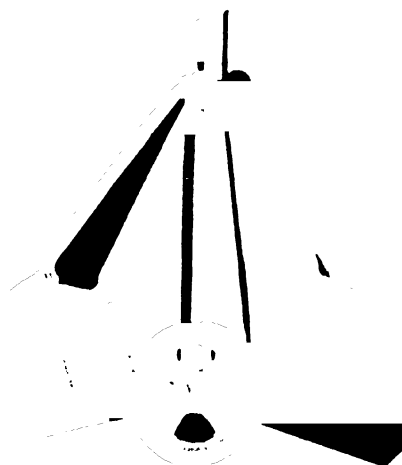
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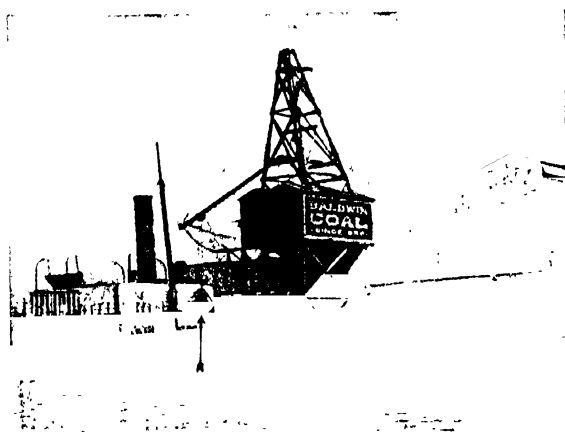
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**HAISS "CONTRACTOR" CLAM SHELL BUCKET**

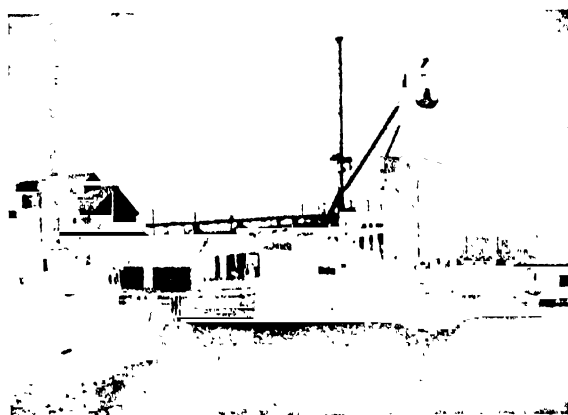
Built strong, of simple design, but employing the most powerful of mechanical principles in its digging operation. Constructed with steel flat-link side plates, rigid cast steel blade arms and bowl braces, and round connecting rods; cast steel head, large rope deflecting idler; wide groove power wheel, large steel shaft and rope guards; bronze bushings, steel pins; Steel shoes around entire cutting edges of bowls. It is a bucket one need not be afraid of using—it is made for rough work. Because of the extra heavy bowl plates and all the steel castings, the closing jaws will not overlap. It hangs straight and digs deep into chemicals, fertilizers, coal, coke, ashes, sand, stone, etc. Teeth can be attached. Powerful rope reeved type buckets also in stock. "Contractor" type bucket capacities— $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1,  $1\frac{1}{4}$ ,  $1\frac{1}{2}$ ,  $1\frac{3}{4}$ , 2 cu yds.

**HAISS "CONTRACTOR" CLAM SHELL BUCKET****UNLOADING TOWERS (FIXED OR MOVABLE)**

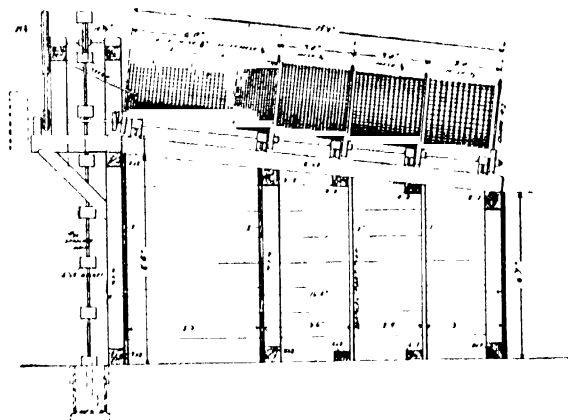
High speed Haiss Unloading Towers are equipped with Haiss steam or electric hoisting engines, clam shell buckets and all fittings. Complete designs submitted for any capacity, and for conforming to local conditions. The towers may be movable or of the stationary type.

**UNLOADING TOWER****LOAD IT MECHANICALLY****MAST AND BOOM UNLOADING PLANT**

The few inexpensive units for a Mast and Boom rig make it the lowest cost equipment for automatic unloading plants. Haiss Co. builds the engine, bucket, fittings, etc., complete.

**MAST AND BOOM UNLOADING PLANT****REVOLVING SCREENS (ON TRUNDLE SHAFTS)**

These screens contain no obstructing center shaft or arms; built in any length, but generally 14 or 18 feet long, and 42 or 48 inches in dia., and can give any number and sizes of material separations. Bucket elevators supplied.

**REVOLVING SCREEN****HOPPER GATES (VARIOUS TYPES)****HOPPER GATE**

Haiss Double-lip Gates are bolted under hoppers holding chemicals, coal, ashes, sand, stone, etc., and are built with

18" x 18" or 24" x 24" square openings. The adjustable counter-weighted handle opens and closes the gate as easily on lump as on fine materials.

**UNLOAD IT MECHANICALLY**

# HARDINGE COMPANY

Conical Ball and Pebble Mills

120 BROADWAY, NEW YORK, N. Y.

Salt Lake City, Utah, Newhouse Building  
London, England, 11-13 Southampton Row

York, Pa. WORKS  
Firth, England

## PRODUCTS

Manufacturers of the Hardinge Conical Ball and Pebble Mill for grinding and pulverizing. Engineers for design and construction of metallurgical and industrial plants.

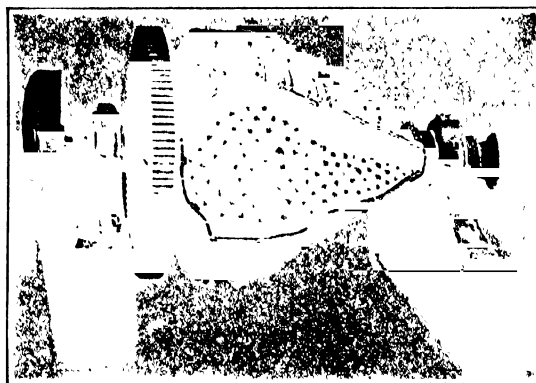
## USES

The Hardinge Conical Mill grinds both wet and dry ores for metallurgical processes and materials for industrial uses, from a maximum size of three inches to a product of any degree of fineness. Some of the materials ground are

Silica	Coal	Gold Ores
Barytes	Cement Clinker	Silver Ores
Pigments	Limestone	Copper Ores
Mica	Phosphate Rock	Lead Ores
Sulphur	Feldspar	Zinc Ores
Foundry Waste	Carborundum	Tungsten Ores

## PRINCIPLE OF OPERATION

The Hardinge Conical Mill operates on the principle of multiplicity of grinding bodies rotated in a conical drum. These bodies, in dropping, crush and grind the material passing through the mill. In the conical mill there exists the logical law of pulverization, i. e., in stages. The large material on entering the mill is crushed by the large balls or pebbles which always remain near the feed end (largest number), due to the classifying action of the cone, and as this partially reduced material travels forward it is further



HOW BALLS SEGREGATE DURING OPERATION OF A HARDINGE CONICAL MILL

ground by the smaller grinding media, and so on until it is discharged at the apex of the cone. The effect of such an action is to proportion the energy to the work required, or in other words, "Use a sledge hammer to drive a spike and a tack hammer to drive a tack." To grind fine material with large balls or pebbles is a waste of energy and to try to crush large feed with small grinding media is futile. This latter action does occur where no natural segregation exists, as in the conical mill.

The net result of this principle is: (A) Action within the conical mill in proportioning the energy to the work performed saves power. (B) A greater range of grinding is made possible as different sizes are roughly segregated and do not interfere with one

another. (C) The capacity of a given size of unit is increased since the ground material is actually forced forward by the classifying effect of the discharge cone. (D) Wear is greatly reduced, as less grinding media are required to effect a given production, and those that are used do effective work, which saves the lining as well. (E) The conical shape insures extreme rigidity and simplicity of construction. Mechanical troubles during operation are almost unknown. Labor cost are next to nothing.



SIXTY-FOUR 8 FT. DIAMETER HARDINGE CONICAL MILLS OPERATED BY TWO MEN PER SHIFT  
APPLICATION TO INDUSTRIAL PROCESSES

## Wet Grinding

**Granular Product**—By properly adjusting the operation of the mill, the material can be made to travel through rapidly, thus insuring a very uniform and granular product.

**Fine Product**—Any product of any fineness up to 350 mesh can be obtained. The equipment used is very simple, self-contained and economical in operation.

## Dry Grinding

**Granular Product**—Due to the principle of operation of the conical mill the "dead" effect of dry as compared to wet material actually aids the operation and causes a rapid travel of the material through the mill which insures a granular and uniform product.

**Fine Product**—A product of any fineness desired, up to 350 mesh, is readily obtainable. The operation is extremely simple and economical.

## APPLICATION TO METALLURGICAL PROCESSES

The Hardinge Conical Ball and Pebble Mills have been used, for a number of years grinding ores and minerals of all kinds, the product being suitable for table concentration, flotation, cyanidation and amalgamation.

## Information Required:

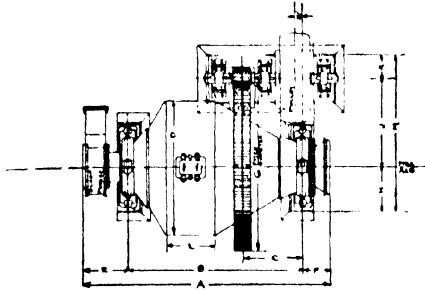
1. Name and address.
2. Character of material.
3. Grinding capacity in tons per hour.
4. Maximum size to be fed Hardinge Mill.
5. Fineness of product desired.
6. Grinding wet or dry.
7. Subsequent process.

*Continued on Next Page*



### THE HARDINGE CONICAL BALL MILL

This type has become very popular within the last few years owing to the large range of reduction possible and large capacity per unit. It is used for both wet and dry grinding processes. Forged steel balls (5" to 2" in diameter) are used where large material is fed to the mill. Cast iron balls (3" to 1/4" in diameter) are used for regrinding. The exact sizes and proportions depend upon operating conditions.



TYPE "B" HARDINGE CONICAL MILL  
GENERAL DIMENSIONS OF CONICAL BALL MILLS  
The Standard Ball Mill is of Type "B" Construction

Size of Mill	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Capacity
3' x 8'	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	1000
4' x 10'	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	1500
5' x 12'	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	2000
6' x 14'	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	2500
7' x 16'	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	3000
8' x 18'	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	3500
9' x 20'	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	4000
10' x 22'	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	4500

### CONICAL BALL MILL SPECIFICATIONS

Size of Mill	Floor Space	Approximate Weights, Pounds		H P to Run	Size of Motor H P	Capacity in Tons Per Hour			Code Word
		Mill Lining	Ball Chg			1/2" to 8" mesh	1/2" to 18" mesh	1/2" to 65" mesh	
3' x 8'	5' x 7'	3800	1100	1000	5	7 1/2	1	1	Bomb
4 1/2' x 10'	7' x 10'	6000	4800	4500	18	25	2	1	Bombu
5' x 12'	9' x 10'	10200	7800	7500	30	35	3	2	Bombu
6' x 14'	10' x 11'	12000	10000	12000	45	50	6	4	Bombu
7' x 16'	11' x 12'	14000	14000	20000	70	75	10	7	Bombu
8' x 18'	12' x 14'	16000	16300	27000	90	100	12	8	Bombu
9' x 20'	13' x 15'	20300	17700	30000	100	100	14	9 1/2	Bombu
10' x 22'	14' x 16'	22000	19400	34000	115	150	18	14	Bombu
11' x 24'	15' x 17'	27400	22900	38000	170	175	24	19	Bombu
12' x 26'	16' x 18'	35000	30000	53000	230	250	33	26	Bombu
13' x 28'	17' x 20'	40000	35000	68000	300	350	45	35	Bombu

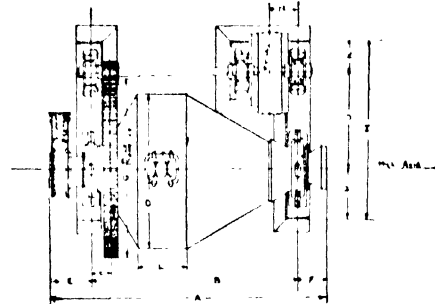
This capacity table must be considered as an approximation only, as every material varies in its resistance to grinding.



INSTALLATION OF HARDINGE MILLS AND HUMMER SEPARATORS GRINDING DRY

### THE HARDINGE CONICAL PEBBLE MILL

This type is particularly desirable where a uniform product is desired, also where the cost of operating a ball mill would exceed that of the equivalent pebble mill. This is usually the case where a very fine product is required. Grinding is done in open or closed circuit, depending upon operating conditions. Flint pebbles (5" to 1" in diameter) are used as grinding media, the sizes and proportions depending upon operating conditions.



TYPE "A" HARDINGE CONICAL MILL  
GENERAL DIMENSIONS OF CONICAL PEBBLE MILLS

Conical Pebble Mills from 3 Ft. to 6 Ft. Dia. Inclusive are of Type B Construction. The 7 Ft. and 8 Ft. Mills are of Type A Construction.

Size of Mill	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Capacity
3' x 8'	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	1000
4' x 10'	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	5' 0"	1500
5' x 12'	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	6' 0"	2000
6' x 14'	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	7' 0"	2500
7' x 16'	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	3000
8' x 18'	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	9' 0"	3500
9' x 20'	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	10' 0"	4000
10' x 22'	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	11' 0"	4500

### CONICAL PEBBLE MILL SPECIFICATIONS

Size of Mill	Floor Space	Approximate Weights, Pounds		H P to Run	Size of Motor H P	Capacity in Tons Per Hour			Code Word
		Mill Lining	Ball Chg			1/2" to 8" mesh	1/2" to 48" mesh	1/2" to 200" mesh	
3' x 8'	5' x 7'	3800	1500	300	3	5	1	1/2	Bombu
4 1/2' x 10'	7' x 10'	6000	3500	9500	8	10	1	1	Bombu
5' x 12'	9' x 10'	10200	4500	9500	12	15	1	1	Bombu
6' x 14'	10' x 11'	12000	5500	9500	18	25	1	1	Bombu
7' x 16'	11' x 12'	14000	6500	9500	27	35	1	1	Bombu
8' x 18'	12' x 14'	16000	7500	9500	35	45	1	1	Bombu
9' x 20'	13' x 15'	20300	8500	9500	45	55	1	1	Bombu
10' x 22'	14' x 16'	22000	9500	9500	55	65	1	1	Bombu
11' x 24'	15' x 17'	27400	10500	9500	65	75	1	1	Bombu

As in the case of the ball mill, the capacity of a given size of mill will differ with every material.



HARDINGE MILL AND CLASSIFIER INSTALLATION FOR GRINDING WET TO ANY FINENESS DESIRED

## HANOVIA CHEMICAL & MFG. COMPANY

Manufacturers of Scientific and Chemical Laboratory Apparatus and Transparent Quartz Glass Laboratory Ware

NEWARK, N. J.

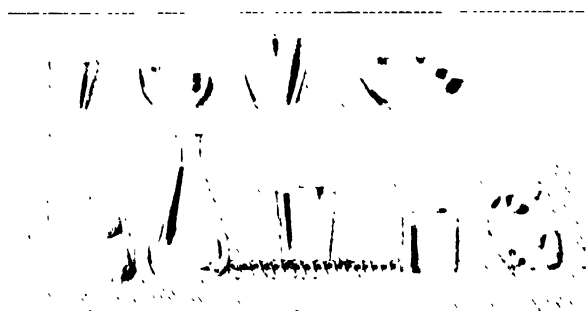
NEW YORK OFFICE 30 CHURCH STREET

### PRODUCTS

Apparatus of Transparent Pure Fused Quartz; Quartz Mercury Arc Lamps for Scientific and Industrial use; Electric Laboratory Furnaces; Electric Temperature Measuring Instruments.

### HANOVIA QUARTZ-GLASS WARE

Fused rock crystal



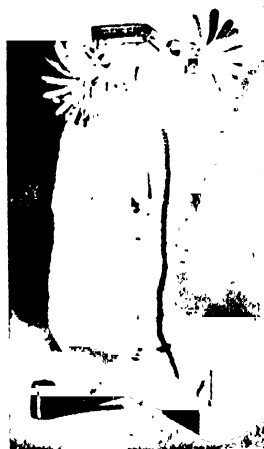
TRANSPARENT QUARTZ GLASS

Our quartz glass is derived from the purest rock crystal and manufactured under scientific methods at our Newark plant. The resultant product is a pure quartz glass of uniform properties and characteristics. The altogether unusual properties found in this ware make it indispensable to many laboratories. It is perfectly transparent, non-hygroscopic, insoluble in water and most acids, its melting-point  $1600^{\circ}\text{C}$ .; its coefficient of expansion between  $1^{\circ}$  and  $1000^{\circ}\text{C}$ . is 0.00000054, and its specific weight 2.22.

We are equipped to manufacture special quartz ware apparatus from specifications and pride ourselves on turning out intricate laboratory implements that other manufacturers cannot attempt.

Our descriptive catalog should always be at hand. Write for Bulletin 10.

### SCIENTIFIC QUARTZ-MERCURY ARC LAMP



QUARTZ-MERCURY ARC LAMP

Scientifically designed and manufactured by practical experts, it is the most powerful source of intense ultra-violet rays and offers the best means of utilization in modern laboratory work. Physical, Chemical, Bacteriological and Physiological Laboratory Workers should be immensely interested in our descriptive Bulletin 20.

### ELECTRIC COMBUSTION FURNACES

For organic analysis.



HANOVIA COMBUSTION FURNACE

This furnace is extensively used in scientific and technical laboratories. It is of unquestionable utility, a combination consisting of two mutually independent furnaces mounted on wheels. A grooved nickel support running thru both furnaces carries the combustion tube and prevents it from bending. Each furnace is provided with a separate rheostat, making possible accurate regulation of the temperature of combustion as well as the temperature of the copper oxide.

Their widespread use today is sufficient proof of their efficiency. Catalog on Muffle Furnaces, Tube Furnaces, Crucible Furnaces, etc., sent on request for Bulletin 15.

# THE HART ROLLER BEARING CO.

*"The Quality"*  
BEARING

Manufacturers of

The Hart Staggered Roller Bearing  
559 MAIN STREET, ORANGE, N. J.

## PRODUCTS

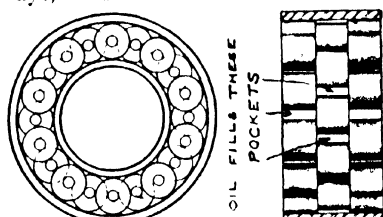
Hart Staggered Roller Bearings for all service.

## SERVICE

Hart Engineering Staff is always at your service and will be pleased to make recommendations and assist in the solution of your bearing problems.

## PRINCIPLE OF THE HART STAGGERED ROLLER BEARING

The Hart STAGGERED Roller Bearing differs from conventional roller bearing design in that short staggered rolls are used, almost completely covering the raceways, thus

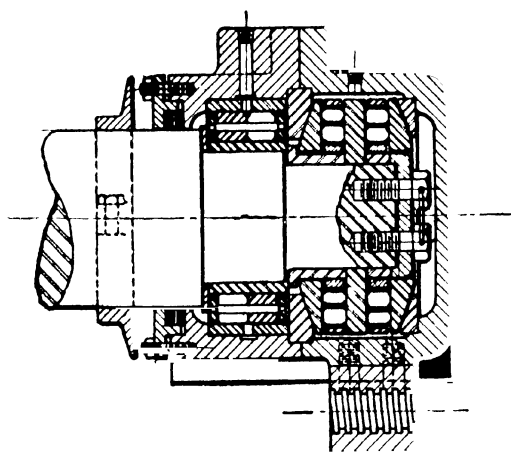


DETAIL OF CONSTRUCTION

Rolls and races are made of High Carbon High Chrome Steel, hardened and ground to precision standards. The rolls are mounted axially on steel pins which are riveted to steel cage rings, and the pins, pins and rolls constitute the roller assembly.

They are used in—

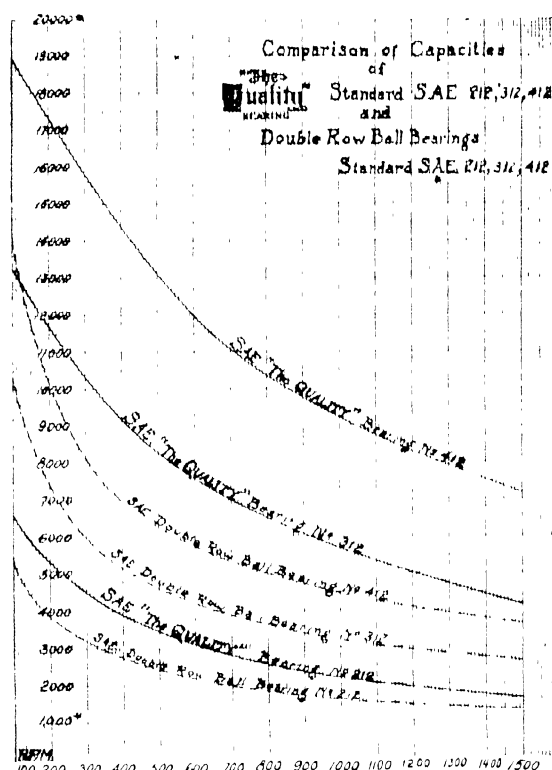
Line Shafting and Jack-	Chemical Plant Machin-
shafts	ery
Cranes	Textile Mill Machinery
Conveyors, Hoists and	Paper Mill Machinery
Winches	Tanning Machinery
Fans and Blowers	Farm Lighting Plants
Electric Motors	Rolling Mills for Steel,
Grinders and Pulverizers	Copper, Rubber, and
Industrial Cars	other Industries
	Mining Machinery



INSTALLATION OF "THE QUALITY" BEARING  
Radial and Self-Aligning Thrust Type in Jordan Engine

## ADVANTAGES OF STAGGERED ROLL CONSTRUCTION

The use of STAGGERED Rolls, made of High Carbon High Chrome Steel, with great accuracy of finish, results in an anti-friction roller bearing free from roller breakage, with superior lubricating ability and greater load carrying capacity than other types of bearings.



Therefore, the Hart STAGGERED Roller Bearing becomes "THE QUALITY" Bearing. Because of the long life, proper distribution of lubricant and great load carrying capacity "THE QUALITY" Bearing applied to machinery permits continuous operation, thereby INCREASING PRODUCTION.

Made in two types—one for carrying radial loads only, the other for thrust loads, "THE QUALITY" Bearing is a one function bearing.

"Do one thing at a time and do that Well."

Hart STAGGERED Roller Bearings do not require adjustment—they are fool-proof.

# HARRISBURG PIPE AND PIPE BENDING CO.



HARRISBURG, PA.



## PRODUCTS

Coils and Bends of all types made of Iron Pipe, Steel Pipe, Seamless Steel Tubing, Copper or Brass Tubing. Producers of Basic Open Hearth Steel. Manufacturers of Hollow Forgings, Billets, Hot Rolled Strip Steel, Narrow Universal Plates, Seamless Steel Cylinders for High Pressure Gases, Forged Seamless Steel Casing, Tubing, Line and Drill Couplings and Feed Water Heaters.

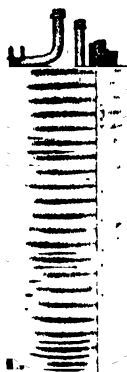
Designers and manufacturers of coils and bends for refrigeration plants, ice manufacturers, ice cream plants, hotels, distilling plants, packing houses, candy plants, cold storage, etc. Chemical Coils for Powder Works, Soap Plants, Oil Refiners, Paint Manufacturers, etc. Steam Heating Coils, Cooling Coils, Coils for Castings.

## INTRODUCTION

Pipe Bending and Coil Manufacture is a highly specialized business. It is seldom that two orders are made alike and it is therefore impossible to give any more than a brief outline of the results we are able to accomplish. A few of the typical styles of coils are illustrated on this page to show the average demands made upon us.

## COILS AND BENDS

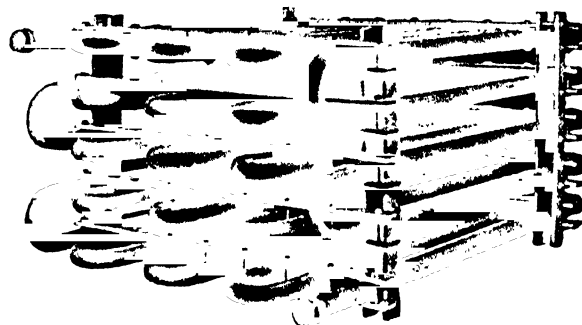
Harrisburg Pipe and Pipe Bending Company is a pioneer in this field. We have executed work for the leading chemical engineers of the country. Every Harrisburg Coil and Bend is thoroughly tested before leaving the plant and is guaranteed to rigidly meet the specifications of the order. Coils or Bends will be made by either Hot or Cold process, either with pipe supplied by the customer or purchased by us at his direction and specification. Our supremacy in the cold bending field is largely due to the special bending machinery, devised and perfected in our own shops.



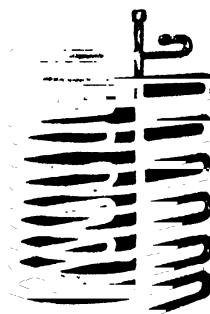
TYPICAL EXAMPLE OF DIFFICULT CYLINDRICAL COIL

Coils may be divided into the following general classes.

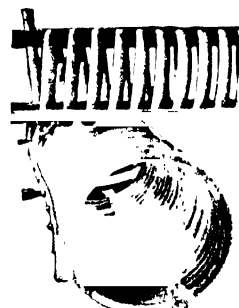
1. Flat Spiral Coils
2. Oval or Oblong Coils.
3. Cylindrical Coils
4. Helical Coils
5. Square or Box Coils.
6. Refrigeration Coils.



REFRIGERATION COIL



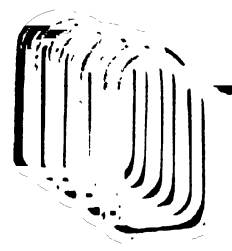
SPECIAL CYLINDRICAL COIL



FLAT COILS



SPECIAL REFRIGERATION COIL



SQUARE OR BOX COIL

STANDARD EXPANSION BEND

## COILS FOR WATER HEATERS

We are making coils for gas and oil water heaters under contract with many manufacturers of such devices.

Our years of experience in handling work of this kind insure our customers a quality of workmanship difficult to obtain elsewhere. Our facilities are so large that we can render unusually prompt and efficient service.

In seeking quotations or in placing orders be sure to advise the kind of pipe and exact dimensions.

*Continued on Next Page*



COILS FOR WATER HEATERS

**SEAMLESS STEEL CYLINDERS**

Plants having occasion to receive and use such high pressure gases as oxygen, hydrogen, phosgene, anhydrous ammonia, chlorine, sulphur dioxide, liquefied petroleum gas, carbonic acid, nitrous oxide, etc., are naturally interested in handling such gases without possibility of accident due to defective containers.

SEAMLESS  
STEEL  
CYLINDER

It will consequently be to the advantage of such plants to protect their own interests by insisting that the shippers of such high pressure gases use Harrisburg Seamless Steel Cylinders.

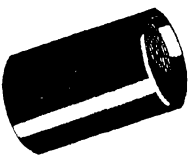
We have every reason to feel that the Harrisburg Cylinder is far superior to anything on the market. We were the first manufacturer to produce a heat treated cylinder. Our plate process insures against piping and leaking bottoms. Our Collars are forged steel, not malleable iron, and hence will not crack or break.

Harrisburg Cylinders conform to the I. C. C. specifications and undergo exhaustive tests by an Inspection Company. As Cylinders must be re-tested every five years, it is also important that a record of the steel analysis is on file with the Bureau of Explosives.

The Harrisburg name and trade-mark is clearly stamped on each cylinder. It will be to your protection and advantage to see that no other is furnished.

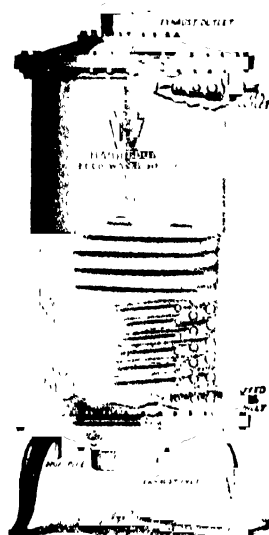
**COUPLINGS**

Harrisburg Forged Seamless Steel Casing, Tubing, Lane and Drill Couplings cover all the conditions required for a perfect coupling regardless of the severity of the service conditions. Harrisburg Couplings will not go out of shape. Will not gall under the most severe strain. Have a perfect thread and perfect taper from the outer ends of the thread to the center. There is no portion



COUPLING

of the thread length that will not engage the thread on the pipe. Made in sizes from 2 inches to 15½ inches. Booklet of tests mailed upon request.



FEED WATER HEATER

**FEED WATER HEATERS**

Will effect a noticeable economy in fuel cost by pre-heating the water before passing it into the boiler. It will also enable the plant engineer to get up steam quickly.

Made in either the Manifold or Box Type, of absolutely high grade material and workmanship throughout. The Harrisburg Feed Water Heater has been giving satisfactory service since its origination twenty-seven years ago.

**FEATURES**

Contains no joints inside of shell to leak.

Made of pure, seamless Copper Coils, brazed solidly to special gun-metal fittings, and supported with our improved clamp stays. All expansion and contraction is taken care of.

No back pressure on Engine, nor oil in boiler possible.

Will heat feed-water instantaneously to 206° to 212°F.

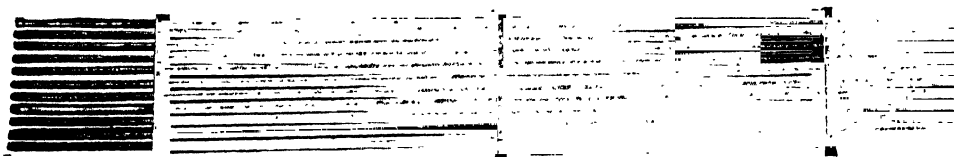
All coils tested to 600 pounds pressure. Cannot be burst by feed pump.

All water in contact only with copper tubing. Nothing to rust out.

No trouble from pumping hot water.

Guaranteed in every particular.

The most durable, effective, and economical Heater produced.



HEATING COILS

# THE HART & HUTCHINSON COMPANY

Steel Lockers, Storalls Cabinets, Shelving, Toilet Partitions

NEW BRITAIN, CONN.

New York  
501 Fifth Ave

Chicago  
73 East Lake St

Philadelphia  
Real Estate Trust Bldg

Boston  
141 Milk St

## PRODUCTS

Steel Lockers, Storalls Cabinets, Shelving, Toilet Partitions.

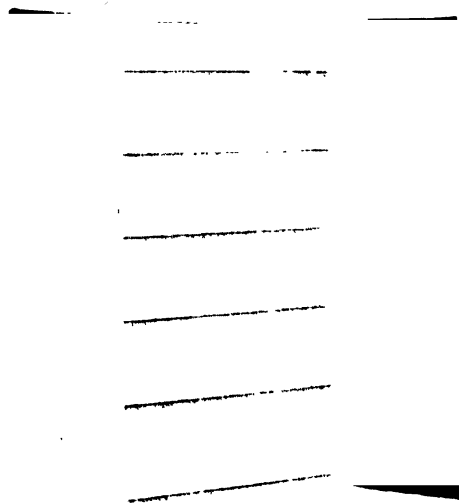
### STEEL STORALLS

The "H & H" Steel Storalls offer to the Chemical Industries equipment for two branches, namely for offices for storage of books, records, cards, stationery and general supplies in a semi-fireproof cabinet. They also make an ideal equipment in the plant for storage of engineering data, sample specimens of various chemicals, master patterns, gauges, etc.

These can be had in the following sizes

36" wide, 18" deep, 72" high      36" wide, 24" deep, 48" high  
36" wide, 24" deep, 72" high      24" wide, 18" deep, 24" high

Made with a secure but quickly adjusted shelf on 2" centers, capacity of shelf one hundred pounds per square foot, equipped with solid brass pin tumbler locks, two non-rusting keys, finished in semi-gloss, olive green, oven-baked enamel.



STEEL STORALL

### STEEL TOILET PARTITIONS

"H & H" Steel Toilet Partitions have been designed primarily to meet conditions in new building operations, however, being built on the unit principle and with parts thoroughly interchangeable, they are used as advantageously as replacement or repair equipment.

They are made entirely of 3-pass cold rolled patent-leveled steel sheets and steel shapes of various gauges, as required for proper rigidity. Adjustable attachments are provided for taking up slight inequalities of building walls or floors so that these partitions can be installed with very little labor by unskilled workmen.

Doors are made with hollow stiles and rails, paneled on both sides of door, and are assembled by electric welding.

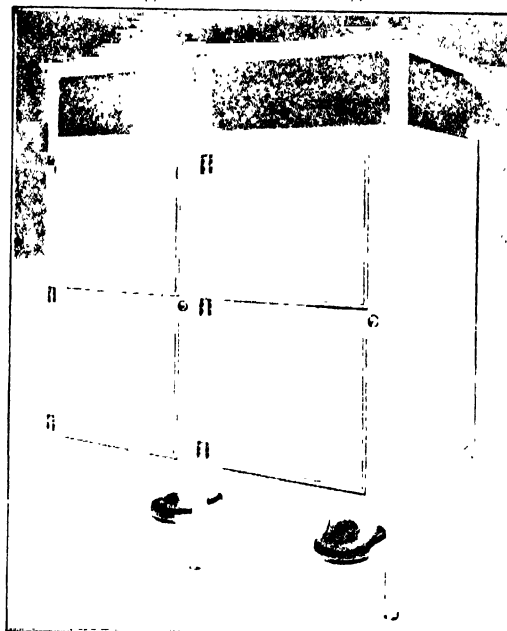
The door pull is of neat design and the inside throw bolt is of an exceptionally heavy design.

Hinges are of gravity design.

Doors can be furnished with or without key locks.

All "H & H" partitions are first thoroughly cleaned and then given a coat of mineral filler of special for-

mula, baked on. They can then be finished with our standard olive green, or can be given the finished



STEEL TOILET PARTITIONS

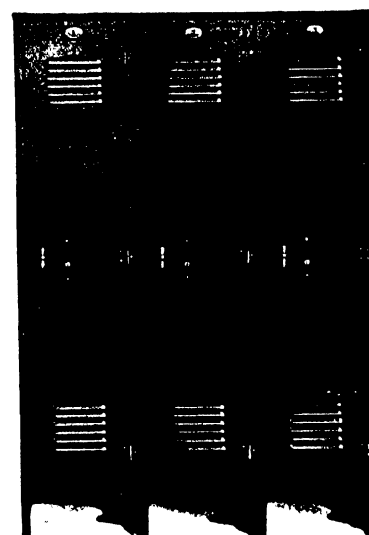
coat after installation, the filler coat being of good color for such treatment.

Shipment made from our factory or branches, knocked down and crated.

## STEEL

### LOCKERS

The "H & H" Steel Lockers for employees' clothing are accepted as standard for such work and are made of special construction employed by this Company only to insure thorough rigidity during the life of the locker and to make possible a strictly unit principle for erection. They are equipped with solid brass pin-tumbler locks, or arranged for padlocks or combination locks,



STEEL LOCKERS

and can be supplied in a variety of sizes. The standard color is olive-green baked enamel. Usually shipped "knocked down with full instructions for erecting. Please forward your specifications or ask for variety of sizes we can supply.

# THE HARTFORD TUBE PRODUCTS COMPANY

HARTFORD, CONN.

## PRODUCTS

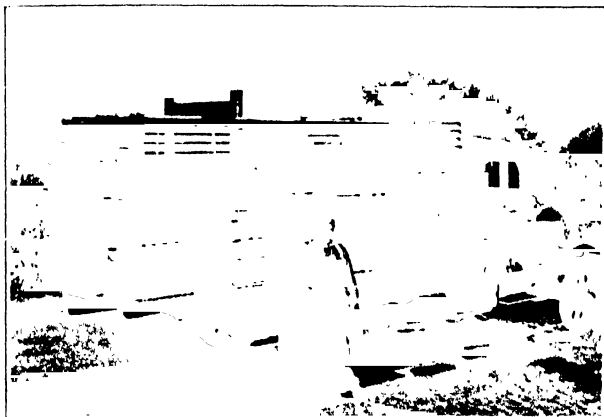
Fabricators of Pipe and Tube Coils of Iron, Steel, Copper and Brass.

Makers of Ammonia Receivers, Oil Separators, Accumulators, Gauge Tanks and other Welded Vessels for High Pressure Service.

Manufacturers of Steam Actuated Hot Water Storage Heaters.

## PIPE COILS

We make coils for every purpose of heating and cooling. The design and size of coil in conjunction with the size of pipe or tube used, obtains practically any desired result in temperature exchange.



BRINE COILS FOR REFRIGERATION

## REFRIGERATING COILS

Electrically welded into continuous length, using wrought iron pipe for ammonia service in

Condensers

Absorbers

Generators

Heaters

For Isbell Porter

Carbondale and

similar Systems

Direct Expansion and Brine Coils for cold storage and hardening rooms, for installation on walls and ceilings, using steel or wrought iron as desired.

## MISCELLANEOUS COILS

Benzol Recovery Coils

Transformer (Electric) Cooling Coils

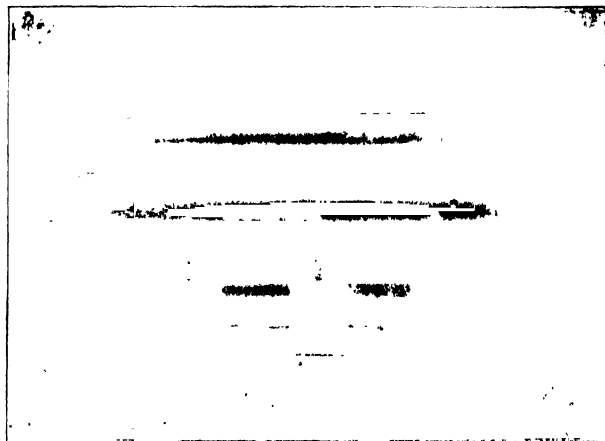
Pasteurizing Coils

Acid Warming Coils

Nitrator Coils

Evaporator Coils

Distilling Coils



AMMONIA RECEIVERS AND ACCUMULATORS

The welding (oxy-acetylene process) of ammonia receivers and other similar containers in which all joints are entirely eliminated is an all important feature of our production.

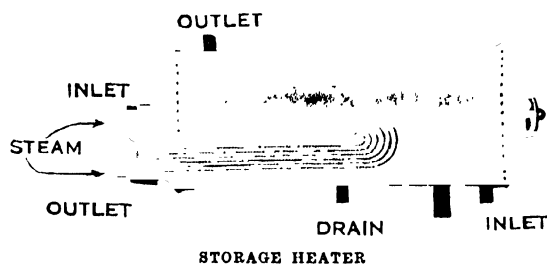
All welded products, likewise all coils, must withstand our hydraulic and air tests, which are purposely high that the interests of our clients may be protected.

Coils of copper and brass tubing, or pipe, are particularly suited to the needs of the chemical industry in a wide and diversified field of service. They are made in any design and subjected to our usual high test.

## STORAGE HEATERS

Hot Water Storage Heaters are universally used in hotels, apartments, laundries, schools, Y. M. C. A.'s and hospitals. In fact, every public building is now equipped with the convenience of hot water for all purposes, obtained from a heater installation in the basement, using exhaust steam as a source of heat transfer.

The requirements of large manufacturing concerns, particularly the textile industries, are similarly met with the use of a heater—employing either exhaust, or live steam, or both, as suited to individual needs.



# THE HAUSER-STANDER TANK CO.

Manufacturers of Wooden Tanks for Every Purpose

Ammen Avenue and B. & O. R. R.

CINCINNATI, OHIO

## PRODUCTS

Wooden tanks, made to the special order of the customer, any shape or size, lead-lined or plain. No "in-stock" tanks carried at any time.

## ADAPTABILITY TO DIFFERENT USES

Rectangular tanks are strongly bolted and braced, the nuts of vertical bolts are countersunk at the top, the holes being plugged up tight with wood plugs so that contents of the tank cannot come in contact with the metal rods.

Malleable washers are used where nuts come in contact with the body of the tank. Truss rods are used in tanks over 72 inches long. All iron rods fitted with cold pressed hexagon nuts. Rods of brass, copper, galvanized or lead-covered material, supplied if specified.

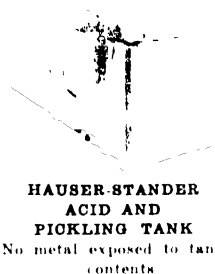
Lead-lined tanks, with burnt-iron joints, are impervious to acids and are used for hot oils, paints, glaze, acids, dyes, soaps, inks, metallurgical mill solutions, etc. Pressure in all cases is correctly determined by engineers, and the rodding and bracing we supply enable us to guarantee them against bulging or leaking.

## DURABILITY

Our catalog illustrates tanks that have been in continuous use from 25 to 40 years, and still are giving service that is satisfactory in every way.

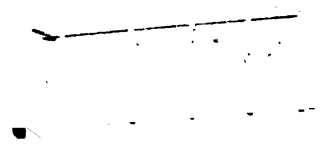
## SIZES

Hauser-Stander tanks can be supplied in any shape, size, capacity or arrangement desired, in the following woods: genuine Louisiana Red Gulf Cypress, Yellow Poplar, Southern Long Leaf Yellow Pine, Quartered or Plain White Oak, Northern White Pine and Oregon Fir.



**HAUSER-STANDER  
ACID AND  
PICKLING TANK**

No metal exposed to tank contents



**RECTANGULAR TANK**

## MATERIAL

The lumber is the best that can be obtained—converted into tanks by labor trained to make each tank mechanically correct.

We are always glad to offer our suggestions to concerns that do not know exactly what material is suited to their particular needs. Our experience in wooden tank construction—covering a period of over half a century—enables us to furnish information that is of inestimable value.



**STANDARD TYPE  
HAUSER-  
STANDER ROUND  
TANK**  
Hooped to meet  
your requirements

## USERS OF HAUSER-STANDER TANKS

That many of the largest chemical manufacturers use Hauser-Stander Tanks, constantly re-ordering as their needs grow larger, is proof positive that our tanks are satisfactory, as well as economical.

## SERVICE

Your requirements receive the attention of experts when you turn the task of supplying your tanks over to us.

The most suitable wood—

The best shape—

The necessary capacity.

And when Hauser-Stander Tanks are installed, you know you can rely upon them for Satisfaction.

## COOPERATIVE SERVICE

This Company maintains a department for cooperation with engineers and chemists in solving problems encountered in selecting and installing wooden tanks for acid and chemical solutions.

## CATALOG

Our catalog, which contains much wooden tank and other information, will be mailed on request.



**TANK WITH  
AGITATOR**



# THE HEIL COMPANY

Manufacturers of Welded Tanks for the Chemical Industries

1100-1200 MONTANA AVE., MILWAUKEE, WIS.

Motive Parts Corporation, 116 West 55th St., New York  
The McKenna Company, 1871 East 15th St., Cleveland, Ohio  
J. F. Northwestern Sales Co., Pelham and St. Anthony Aves., St. Paul, Minn.

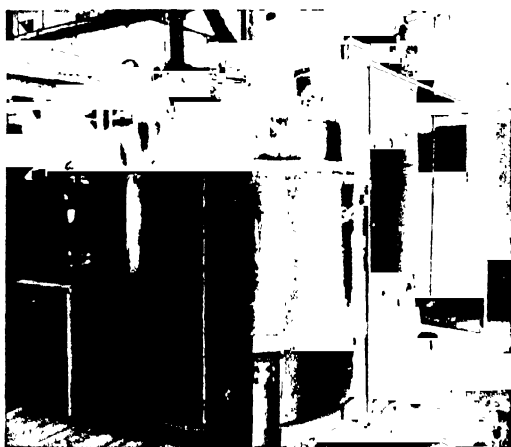
The Heil Company, 2718 20th Wentworth Ave., Chicago, Ill.  
The Modern Vehicle Co., 137 151 Fourth St., San Francisco, Calif.  
General Auto Truck Co., Virginia and 21st Sts., Washington, D. C.

## PRODUCTS

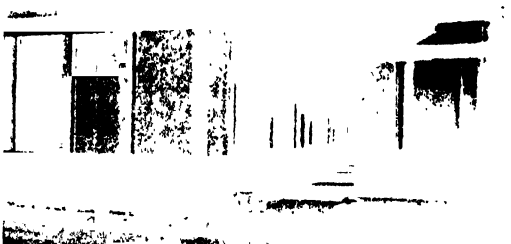
Tanks for all purposes	Steel Stacks
Gasoline Storage Tanks	Underground Gasoline Tanks
Air Receivers	Varnish Tanks
Rectangular Storage Tanks	Pneumatic Pressure Tanks
Standard Storage Tanks	Lead Lined Tanks

## JACKETED STILL

This still is suitable either for steam heating or brine cooling. It is electric welded construction, which is recognized as superior to riveted steel plate work. With welded construction there are no rivets around which sediment can collect, thus permitting acid to destroy the material. Heil Tanks are all electrically welded.



JACKETED STILL FOR NEWPORT CHEMICAL CO

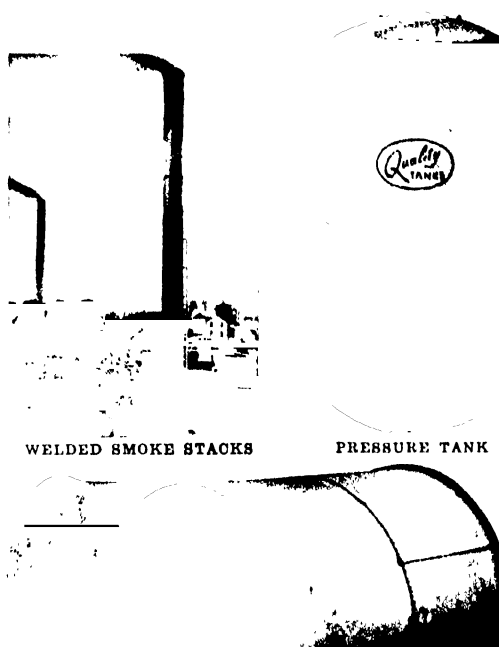


VARNISH TANKS

Typical Installation at the Patton Pittsarn Division—Pittsburg Plate Glass Co.



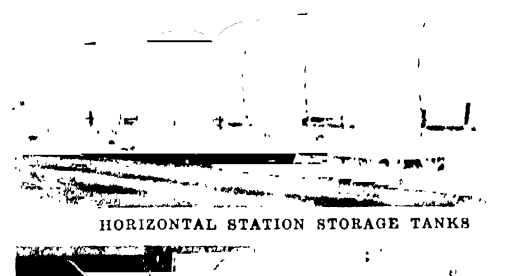
FOUR MIXING TANKS WITH AGITATORS



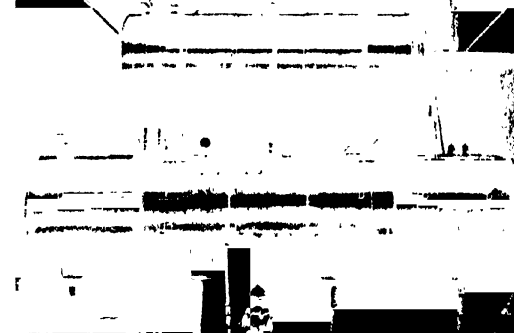
WELDED SMOKE STACKS

PRESSURE TANK

OPEN TOP TANKS USED BY NEWPORT CHEMICAL CO



HORIZONTAL STATION STORAGE TANKS



FOAMITE FIREFOAM ENGINE

Consists of Two Lead Lined Tanks

# S. S. HEPWORTH COMPANY

Manufacturers of Centrifugal Machines

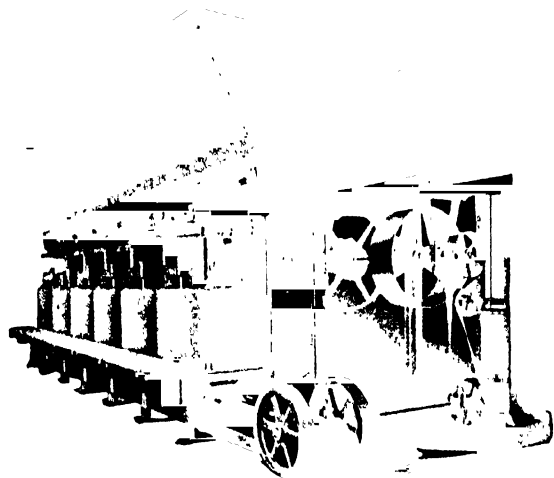
2 Rector Street  
NEW YORK

## PRODUCTS

Mackintosh Ball Bearing Centrifugals with Belt, Electric or Hydraulic Drive; Hoppers and Valves for charging Centrifugals; Mackintosh Unloaders; Vibratory Conveyors; Scroll Conveyors; Elevators.

## MACKINTOSH CENTRIFUGALS

Mackintosh Centrifugals are furnished with every improvement that exacting test and long experience have been able to develop:



A BATTERY OF 6 MACKINTOSH BELT DRIVEN 40" CENTRIFUGALS

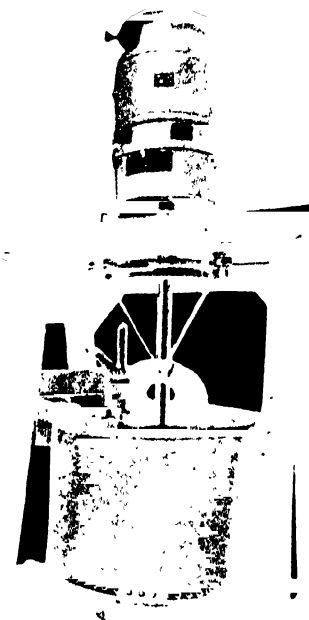
**Brakes**—Easy of access, self-locking, readily adjusted, quick acting. Separate brake drum prevents baking of belts.

**Machines**—Improved Weston type, self-steadying, without buffers, with a single easily accessible ball-bearing.

**Friction Pulleys**—Readily adjusted and without flying arms; do not bake the belts.

**Idlers**—Keep belts tight automatically, do not distort belts; arrangement for slacking off permits use of endless belts.

**Baskets**—Have large bottom openings permitting rapid discharge of contents.



ELECTRIC CENTRIFUGAL

**Electric Drive**—Mackintosh electrically driven centrifugals are provided with two speed motors. The high speed being suitable for drying materials and the lower speed automatically decreasing the torque of the friction clutch so that this torque balances the drag of the mechanical unloader maintaining the basket speed at a point suitable for unloading. This method of drive is patented in the United States and foreign countries.

## MACKINTOSH UNLOADERS

Remove material rapidly from the baskets, thereby effecting great saving of time and labor. Easy on screens.



UNLOADER

For discharging dried material from centrifugal machine

# HERRESHOFF FURNACE DEPARTMENT

of the  
GENERAL CHEMICAL COMPANY

25 Broad Street  
NEW YORK, N. Y.

of the  
PACIFIC FOUNDRY COMPANY

18th and Harrison Streets  
SAN FRANCISCO, CAL.

## PRODUCTS

The New Herreshoff Furnace

for Roasting Ores { (a) for the Manufacture of Acids  
(b) for Metallurgical Purposes.

for Calcining and Drying.

## THE NEW HERRESHOFF FURNACE

In the roasting of ore the problem is to so manage the operation that as high a temperature as possible may be used at each step of the roasting, without at any time reaching conditions that cause fusion. By means of patented temperature control features incorporated in the **New Herreshoff Furnace** these temperature requirements, so essential to successful operation, can be efficiently maintained.

In the **Calcination and Drying** of materials where specific temperatures must be maintained for a given period of time, the **New Herreshoff Furnace** offers the advantage of economy of space economy of fuel: a large hearth area on which each particle of the material is exposed to the required temperature by means of specially designed rabblers and a simple and effective temperature control.

Air is used for cooling the **New Herreshoff Furnace** and its function is fourfold.

1st—It keeps the cast iron shaft and arms at a temperature where the metal possesses its maximum strength.

2nd—It serves to regulate the temperature of the roasting process itself, for, since it is a forced draught, it can be exactly controlled, and so regulated as to maintain a proper temperature inside the furnace.

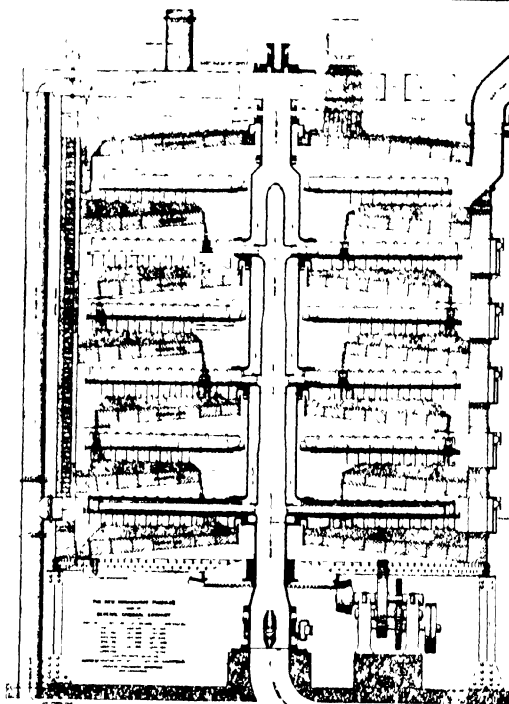
3rd—It permits the installation of temperature control flues, which absorb any excessive localized heat and transmit it to the cooler zones of the furnace.

4th—It permits the utilization of waste heat for combustion, either with or without the use of extraneous fuel.

## CONSTRUCTION

The **New Herreshoff Furnace** has a cylindrical steel shell placed vertically, lined with red or fire brick, and in this shell brick hearths are placed horizontally one above the other. Utilization of the top (or roof) of the first hearth has been made so that it acts as a pre-heater. The ore drops from the hopper to this preheating hearth and is rabbled across it, thereby freeing itself of a great portion of its moisture content before entering the furnace. Passing down through the center of these hearths is a double vertical hollow shaft. Attached to this shaft are one or two removable arms at each shelf, and replaceable rabblers, or teeth. On the first hearth they are placed at such an angle that the revolving arms plow and turn the roasting ore over in a regular way, making it travel from the center of the hearth outward. From there it discharges through proper openings onto the hearth below, where the teeth are placed at an opposite angle to the one above so as to turn and plow the ore from the outside toward the center of the furnace, where it again drops to the hearth below, as shown in the vertical section. This operation is repeated until the ore finally discharges through an opening placed at the outer edge of the bottom hearth. The rabble teeth are so arranged, in regard to their pitch and progression, that the movable ore body maintains a regular form of furrows equal in depth, from the center to the circumference on all hearths.

The life of the central shaft and arms, as well as the teeth, is prolonged by internal cooling. This cooling is accom-



THE NEW HERRESHOFF FURNACE

plished by air, which is forced into the bottom of the shaft, as shown in the illustration, and then delivered through the central shaft, from which it passes in multiple at once into all the arms. After cooling the arms and shaft the air is conveyed to the annular bustle pipe surmounting the vertical temperature flues, through which it passes to the bottom shelf, fulfilling a twofold purpose: first, the equalization of temperatures on the hearths; second, additional oxidation for combustion by the admixture of preheated air.

## SIZES

The **Herreshoff Furnace** is built in diameters of 11'-7½", 15'-9¾", 18'-0", 19'-6", 21'-6", with from 5 to 9 hearths as required. In addition a laboratory size has been developed for experimental purposes. This has a diameter of 4'-6" with 6 to 10 hearths as required.

## USES

There were in 1921 over 2200 of various sizes of the **Herreshoff Furnace** in practical and economical operation in the following fields:

- 1—Roasting pyrites for manufacture of sulphuric acid
- 2—Roasting pyrites for manufacture of sulphite pulp.
- 3—Roasting pyrrhotite
- 4—Roasting of mixed sulphides for magnetic separation
- 5—Preliminary roasting of simple or complex sulphides for metallurgical work
- 6—Calcination of materials where specific temperatures must be maintained for a given period of time
- 7—Drying.

## INQUIRIES

Each inquiry is treated as a special engineering problem.

# HERCULES ENGINEERING CORPORATION

Special Chemical and Industrial Apparatus

Cable Address  
"HERCULESCO"

501 FIFTH AVENUE (42D STREET, NEW YORK, N. Y.)

Monadnock Building  
Chicago

Exelsior Life Building  
Toronto

Telephone  
MURRAY HU  
8092 to 8093

## PRODUCTS

Evaporators, single and multiple effect.  
CO<sub>2</sub> Generating and Liquefying Plants.  
Chlorine Liquefying Plants.  
Nitrators      Condensers      De-alcoholizers  
Autoclaves    Sulphonators      Solvent Recovery  
Acid Eggs      Electrolytic Cells.    Gas Cylinders  
Preheaters    Stills

## SERVICE

The Hercules Engineering Corporation specializes in the production of chemical plant machinery of the most approved type. The rapid growth of the American chemical industry is partly due to the wide use of special equipment expressly designed for maximum yield per dollar of operating cost. Our organization includes chemical engineers with more than 20 years of experience in every branch of this industry, who study the requirements of each individual case and guarantee the satisfactory performance of their machinery.

## EVAPORATORS

The properties of solutions vary to such an extent that it requires several types of evaporators to be able to handle each to best advantage. The Hercules Engineering Corporation has achieved gratifying success with the three types of evaporators described below. These have been perfected by the cooperation of our chemical engineers with our consulting engineer, Mr. Otto Mantus, one of the leading experts in this country on evaporator practise. While these designs are not new as to their basic construction, they have various features which make them especially attractive.

In all cases the heating surface is adequate, the steam properly distributed, a lively circulation of the liquor is induced to secure a high rate of heat transfer per square foot of surface, and arrangements made for the complete removal of air and non-condensable gases. The vapor body of each evaporator is so constructed that losses by entrainment or foaming are reduced to a minimum. All important

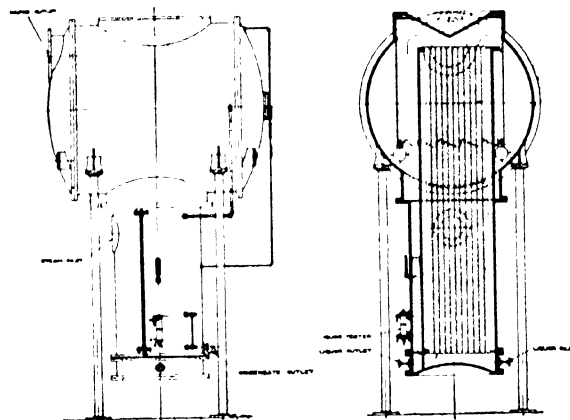


FIG. 1-72-IN. VERTICAL FILM TYPE EVAPORATOR  
SERIES 8-101

parts contain enough metal to insure long life under hard service with low cost of upkeep. Auxiliary apparatus is either built according to our design or purchased according to our specifications from reliable manufacturers.

Every installation is carefully engineered to insure a well balanced plant yielding a uniform product and maximum capacity with least difficulty. Instructions are given at all times how to operate the equipment to secure the highest possible efficiency. Such an installation is not likely to be the cheapest in first cost, but on account of high economy, ease of operation and low cost of upkeep, it will prove to be the cheapest in the long run.

## HERCULES FILM TYPE EVAPORATORS

Theory and practise have shown conclusively that the film type of evaporator has not only the highest capacity per square foot of heating surface, but will also prevent practically all losses due to entrainment or foaming.

Fig. 1 illustrates a Hercules Film Evaporator of the vertical tube type. The apparatus consists of a horizontal cylindrical shell forming the vapor body, and a vertical cylindrical shell partly extending up into the vapor body, forming the steam chest.

Fig. 2 shows the assembly of a quadruple effect, Series 101, Hercules Vertical Film Type Evaporator,

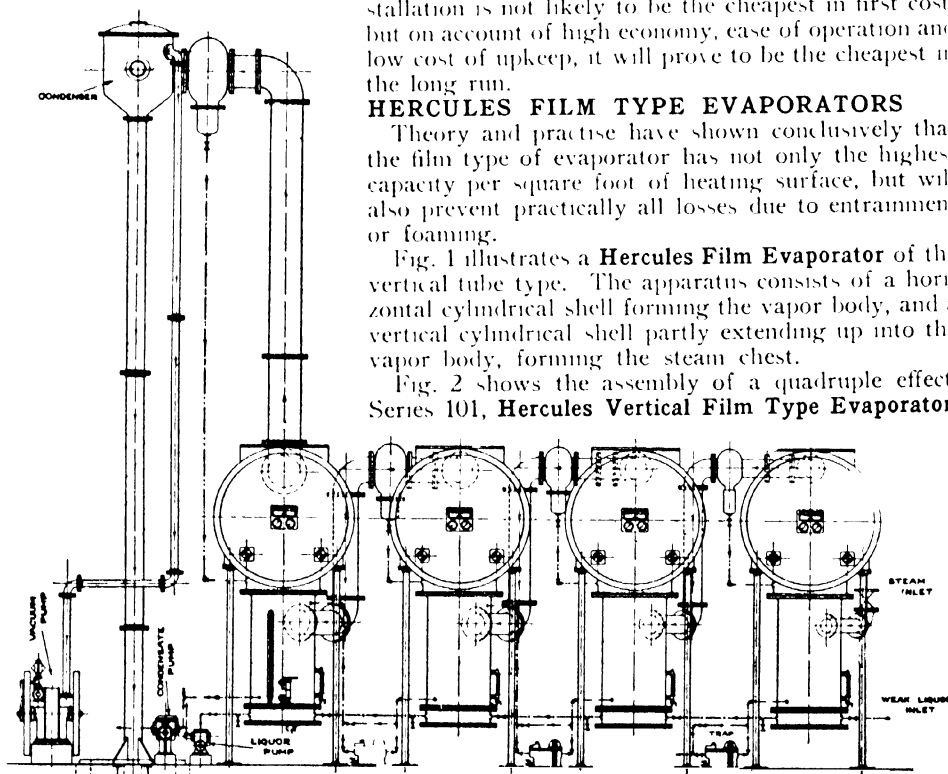


FIG. 2-72-IN. FILM TYPE QUADRUPLE EFFECT EVAPORATOR, SERIES 8-101

*Continued on Next Page*

72 in. diameter. It will be noticed that the arrangement requires little floor space, and all pipe connections are very simple.

The Hercules Film Type Evaporator can be built of cast iron, copper, aluminum, also lead lined, in standard sizes containing 120 to 3000 square feet of heating surface in each effect, larger units being special. For fruit juices and food products, vapor belts can be built of enameled steel.

#### HERCULES VERTICAL TYPE EVAPORATORS

Fig. 3 shows a series 201 Hercules Vertical Type of Evaporator, in all-copper construction which is generally used for the concentration of tanning extract and other solutions containing organic acids.

Fig. 4 illustrates a second form of the Hercules Vertical Type Evaporator. Here the steam chest does not form an integral part of the evaporator shell but is of the floating or basket type, leaving a large annular downtake between the steam chest and the liquor belt. This type of evaporator is generally used for liquors from which salts separate during concentration, the wide area of the downtake and the large space in the cone bottom permitting a good separation of the precipitated salts.

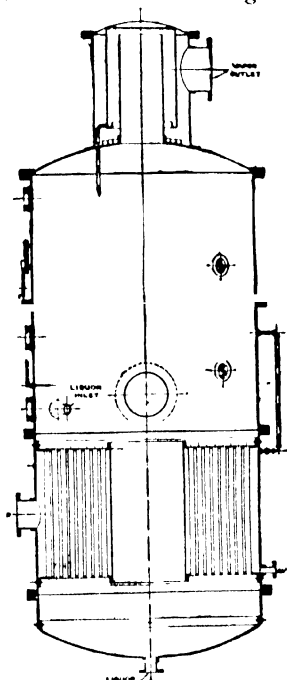


FIG. 3—84 IN. VERTICAL COPPER EVAPORATOR, SERIES S-201

Fig. 5 shows the arrangement of a 96-in. Series 202 Hercules Vertical Double Effect Evaporator complete with 60 in. diameter salt filters, dry condensing system, preheater and pumps, for the concentration of electrolytic caustic solutions. The vapor connections and liquor lines are very simple and so arranged that each effect can be shut off without interfering with the work in the other effects. The salts are discharged from the bottom outlet into salt filters as shown.

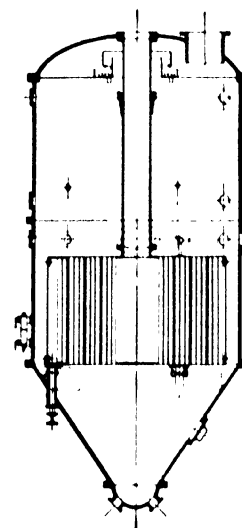


FIG. 4—96 IN VERTICAL EVAPORATOR, SERIES S-202

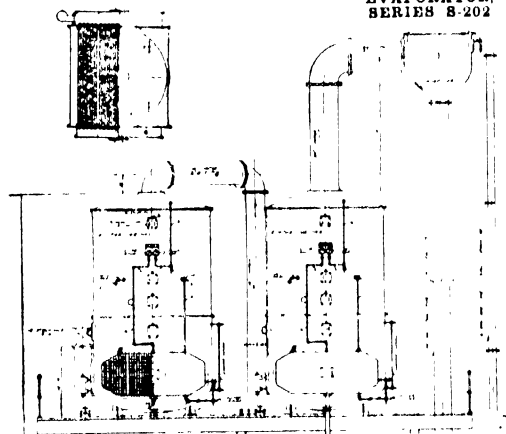


FIG. 6—GENERAL ARRANGEMENT 96 IN. DIAMETER HORIZONTAL DOUBLE EFFECT EVAPORATOR, TYPE S-304  
FIG. 6A—INSERT SHOWS HORIZONTAL CROSS-SECTION THROUGH STEAM CHEST OF ONE EFFECT

#### HERCULES HORIZONTAL TYPE EVAPORATORS

Fig. 6 shows the construction of a Hercules Horizontal Type Evaporator designed especially for black liquor, but equally suitable for many other materials.

Fig. 7 represents another form of Hercules Horizontal Type Evaporator, the Oval shape, in which all flat surfaces are braced and anchored to prevent excessive strain or breakage from inside or outside pressure. The construction of the tube surface in this design is the same as that described for the Circular Type, but the vapor space is especially high in order to prevent losses by entrainment and foaming. As an additional safeguard we add, in severe cases, separate interior or exterior catch-alls or entrainment separators.

Both of these types of Evaporators can be built of cast iron, bronze, copper, steel

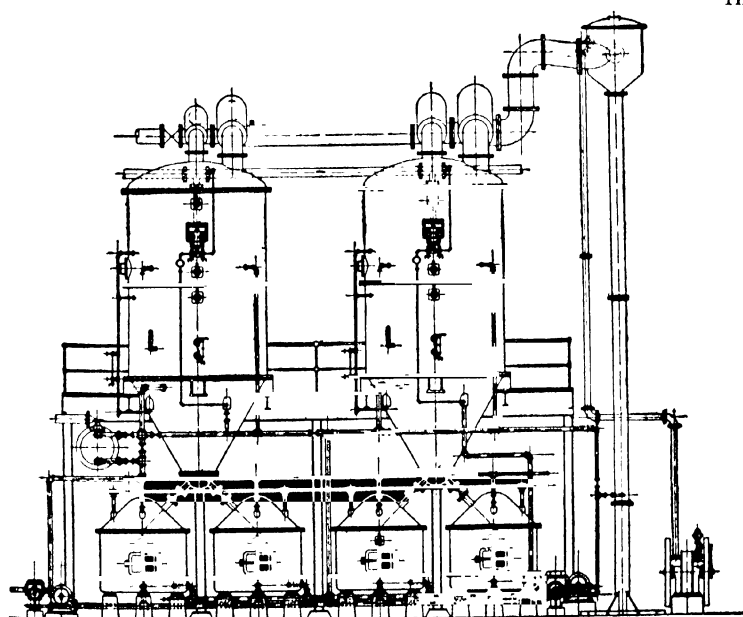


FIG. 5—96 IN. VERTICAL DOUBLE EFFECT EVAPORATOR, SERIES S-202, WITH 60-IN. SALT FILTER

*Continued on Next Page*

or other metals. The standard sizes contain heating surfaces from 250 to 2500 square feet in each effect.

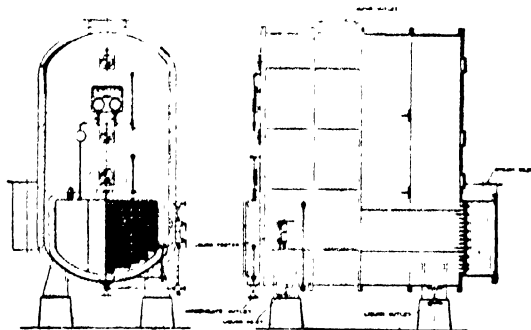


FIG. 7 60 IN OVAL EVAPORATOR, SERIES S-302

### LIQUOR LEVEL REGULATOR

A uniform liquor level is essential in efficient evaporator operation. We make two types, the first regulating the flow of the liquor entering the evaporator, the second controlling the outgoing liquor. Both types consist of a large float and a butterfly or Corliss valve connected to the float lever, the construction being such that the level can be regulated within wide limits without interfering with the operation of the valve.

The installation of such a regulator will pay for itself within a very short time, and it will give the operator a chance to do something more than to watch liquor levels.

### LIQUOR TESTERS

The Hercules Standard Liquor Tester shown in Fig. 8 is simple, strong and compact, eliminating a number of joints and preventing leakage which frequently makes trouble in a standard design. It can be furnished in cast iron, bronze or monel metal, and all parts are easily cleaned and repaired.

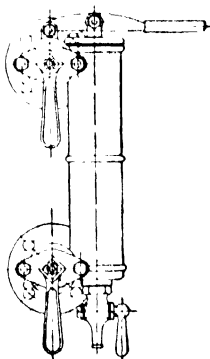


FIG. 8—LIQUOR TESTER

### HERCULES AUTOCLAVES

Hercules autoclaves include an ample factor of safety and are made of materials best suited for the service intended. We have many patterns, and are able to supply an autoclave exactly adapted to its work. Fig. 9 is a cross section and Fig. 10 an exterior view of Hercules Autoclaves. They are usually made of cast steel or our cast iron-steel mixture of high tensile strength and density. Our standard agitating mechanism (see Figs. 11 and 12), insures satisfactory service from a mechanical point of view. Jackets of cast iron or steel may be added to permit steam or hot oil heating.

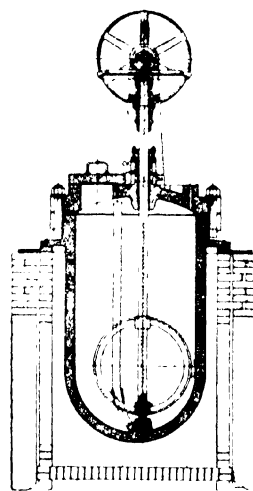


FIG. 9—CROSS SECTION  
HERCULES AUTOCLAVE



FIG. 10—EXTERIOR HERCULES  
AUTOCLAVE

### HERCULES NITRATORS

Built in capacities of 200 to 600 gal. Due to the use of hollow ribbed "cooling fingers" (see Fig. 11) in conjunction with jacket cooling, forced circulation of water, and effective agitation, the daily output of these nitrators is larger than in the case of other nitrators of like dimensions. Pot and cover are made of special acid-resisting cast iron, and extra strong

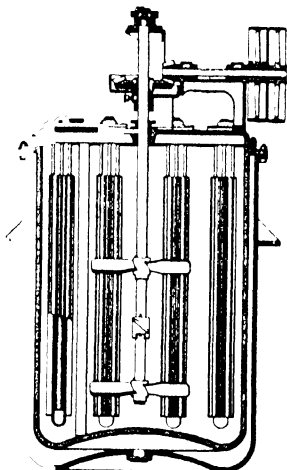


FIG. 11—HERCULES NITRATOR

### HERCULES SULPHONATORS

See Fig. 12. Built of acid resisting cast iron. A well designed stirrer provides all needed agitation, and the steam heating jacket surrounds the entire body. Construction is heavy.

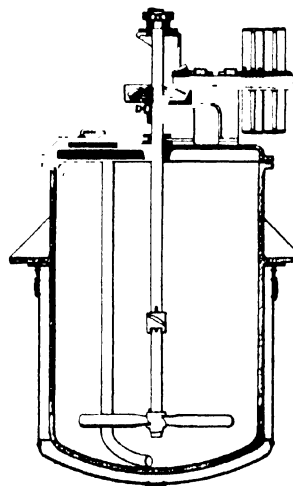
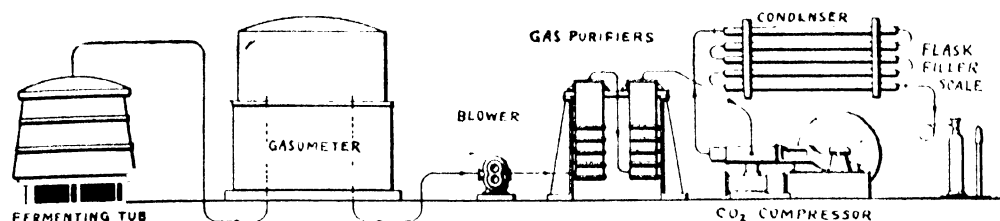
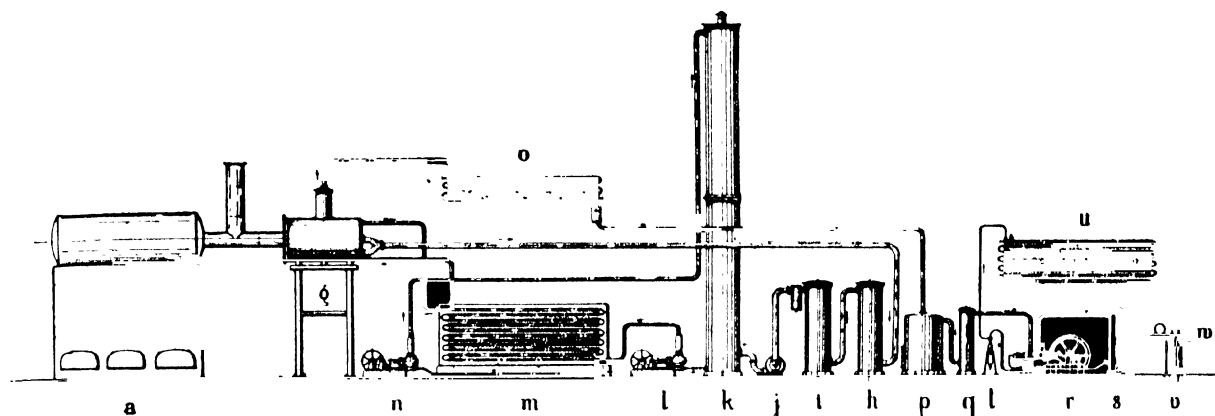


FIG. 12—HERCULES SULPHO-  
NATOR

### STILLS AND SOL- VENT RECOVERY

We design, build and operate fractional distilling equipment, for atmospheric or vacuum conditions, continuous or intermittent service, for many substances. Our engineers undertake the engineering and placing in operation of such plants.

*Continued on Next Page*

FIG. 13—CO<sub>2</sub> PLANT FERMENTATION PROCESSFIG. 14 CO<sub>2</sub> PLANT COKE PROCESS

a—Steam boiler    g—Lye boiler    h—Water washer    i—Soda washer    j—Blower    k—Absorption tower    l—Strong lye pump  
 b—Heat exchanger    n—Weak lye pump    o—Carbonic acid cooler    p—Gas holder    q—Calcium chloride dryer    r—CO<sub>2</sub> compressor  
 c—Charcoal filter    u—CO<sub>2</sub> condenser    v—Filler on scale    w—Gas cylinder

### CARBON DIOXIDE GENERATING AND LIQUEFYING PLANTS

100 to 1000 lb. per hour from coke, fermentation, and natural sources. Latest construction. Highest efficiency, and economy guaranteed.

We have recently completed one of the most economical CO<sub>2</sub> installations in the country which we would be glad to refer you to.

#### THE JEWELL CELL

##### Advantages

- Minimum floor space
- Maximum efficiency
- Tested and Tried
- Complete cell installations with Caustic Recovery

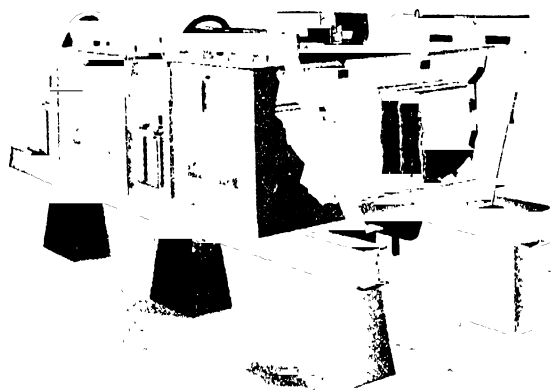


FIG. 15—JEWELL CELL

Eliminates all objectionable features. Insures easy and safe operation.

The Jewell Chlorine Regulating Devices will interest you. Write for information.

### CHLORINE LIQUEFYING PLANTS—USING HERCULES CHLORINE COMPRESSOR

Operating on the combined high-pressure and low temperature process. Capacity 2 to 25 tons per 24 hours. Excellent results guaranteed. Design and workmanship based on 15 years' practical experience abroad and in the United States. These plants are low in upkeep and easy to operate. Expert instructors furnished to break in operating crew. We have installations that are producing constantly and at minimum operating cost—no refrigeration required.

#### STEEL CYLINDERS

Furnished for all compressed gases, such as oxygen, hydrogen, carbon dioxide and chlorine, supplied with or without our special valve. The Hercules cylinder valve, Fig. 18, reduces leakage and saves expense because only one valve will serve a number of cylinders, it being screwed into plug A, Fig. 16 when required (see Fig. 17). Strong, non-corrosive. Meets all safety and I. C. C. requirements.

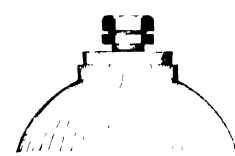


Fig. 16—Cylinder capped for shipment

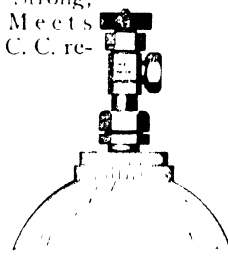


Fig. 17—Valve inserted for emptying or filling

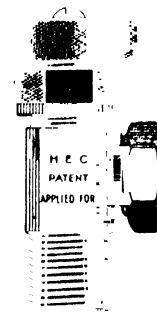


Fig. 18 Valve

HERCULES VALVE FOR COMPRESSED GAS CYLINDER

# HIERGESELL BROTHERS

2007-9-11-13 Bellevue Ave.,

PHILADELPHIA, PA.

BRANCH OFFICE Los Angeles, Calif

## PRODUCTS

Hiergesell Gas Absorption apparatus. Hydrometers. Scientific Glassware for Industrial and Research Laboratories. Thermometers. Thermo-hydrometers. Special Glassware.

## HIERGESELL GAS ABSORPTION APPARATUS

For determining the gasoline content of still and natural gas

## SCIENTIFIC GLASSWARE FOR INDUSTRIAL AND RESEARCH LABORATORIES

Scientific Glassblowing in all its branches. Conversion of glass into special apparatus to suit standard or individual requirements. Complete line of glassware carried in stock for immediate delivery. Special glassware made to order.

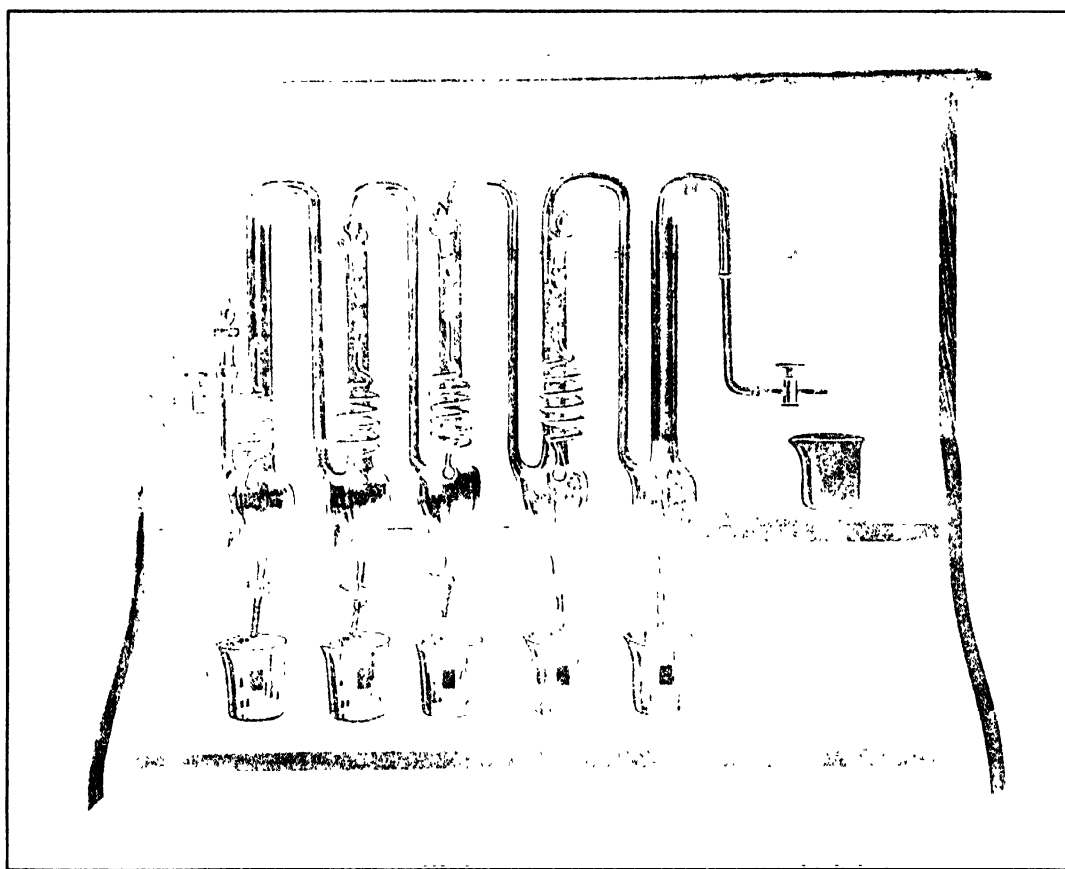
## HYDROMETERS AND THERMO-HYDROMETERS

Hydrometers and Thermo-hydrometers arranged in series of sets for the chemist, with or without official or unofficial certificates. Graduated according to standards of adopted value for the inspection of petroleum and its products, milk, glue, acids, sugar spirits, etc. Our hydrometers are constructed to withstand breakage from ordinary handling and are capable of standing an accuracy check qualifying same for official precision stamp by the National Bureau of Standards. Private scale hydrometers made to order promptly.

Literature on request. Correspondence solicited.

## THERMOMETERS

Plant and Laboratory thermometers of the indicating type covering a variety of uses, supplied with and without official and unofficial certificates. Long stem thermometers, Calorimetric, Cold Test, Maximum, Minimum, Chemical Test, Six's Self Registering, Thermostatic, etc.



HIERGESELL GAS ABSORPTION APPARATUS



# THE HINDE & DAUCH PAPER COMPANY

255 WATER STREET, SANDUSKY, OHIO

## SALES OFFICES

BALTIMORE  
BOSTON  
CHICAGO

CLEVELAND  
DETROIT  
MINNEAPOLIS  
TORONTO, ONTARIO

NEW YORK  
PHILADELPHIA  
PITTSBURGH

RICHMOND  
ST. LOUIS  
TOLDO

## PRODUCTS

Corrugated Fibre Shipping Boxes, Bottle Wrappers and Packing Materials.

### CORRUGATED FIBRE SHIPPING BOXES

Hinde & Dauch corrugated fibre boxes are made up of a layer of corrugated paper, each side of which is faced with a tough "mute" paper. This form of construction



STANDARD CORRUGATED FIBRE BOX

is especially adapted to withstand severe shocks and jars without injury to the contents of the package, and may be used for making shipments not exceeding 90 pounds gross weight. The construction is made to conform with the regulations governing shipments by freight, express or parcel post.

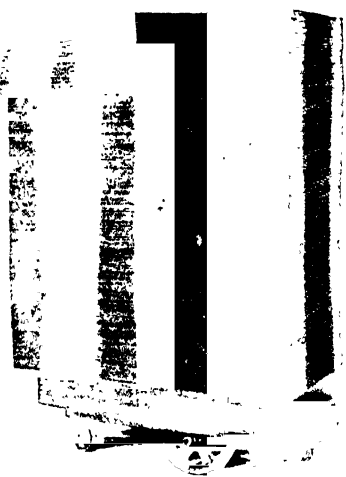
H & D corrugated fibre boxes folded flat as here shown are compact and require the minimum amount of storage space in the shipping room until required for use. They are simple to set up, easy to close and stack. The use of these containers eliminates a large portion of the waste material and refuse found in most shipping departments.

The difference in weight as compared with wooden boxes effects a considerable saving in freight charges.

The cellular construction not only prevents breakage, but also serves to protect the contents of the package from freezing or overheating.

The glued seal discourages petty thieving as it can not be readily reestablished without detection.

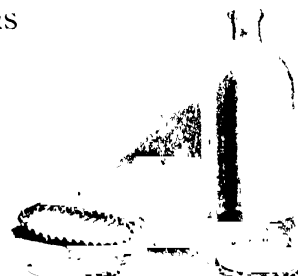
In addition to the advantages already mentioned the cost of corrugated fibre containers is much less than that of wooden boxes of corresponding capacity.



TRUCK LOAD OF FIBRE BOXES

## BOTTLE WRAPPERS

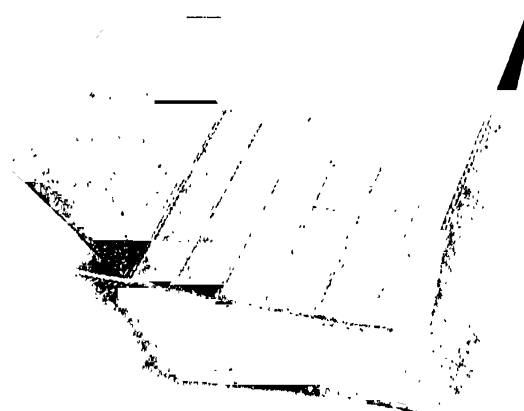
H & D bottle wrappers and cartons, used for the further protection of liquids in glass, and of all fragile articles in shipment are also supplied in any size required. These prevent breakage from concussion of glass containers inside the shipping package. They are inexpensive, and easily adjusted to their contents.



BOTTLE WRAPPER

## PARTITIONS

Partitions are often used in H & D boxes to separate fragile articles which may form the units of the contents. They form separate compartments for the reception of the individual articles to be packed together in the same box, and enclose the contents of each cell.



BOX LINED AND PARTITIONS INSERTED

## USE

The use of corrugated fibre containers is almost unlimited for shipping purposes as indicated by the character of the commodities mentioned in the following partial list, all of which may be transported satisfactorily in this manner:

Abrasives	Laboratory supplies
Acids, in glass or other containers	Lamp globe, and shades
Bottles, empty or filled	Macaroni
Canned goods	Ore samples
Chemicals, in other containers	Paper goods
Drugs, bulk and in other containers	Porcelainware
Dyestuffs, in other containers	Roots
Earthenware	Rubber goods
Eggs	Soap
Fruits	Starch
Glassware	Textiles
Hardware	Tobacco
Herbs	Umbrellas
Jars, empty or filled	Woodenware

# HIRSCH-CRAWFORD COMPANY

200 HARTMAN BLDG., COLUMBUS, OHIO

SOLE AGENTS FOR THE UNITED STATES AND ITS POSSESSIONS OF

**THE CLEVELAND BREATHING MACHINE COMPANY**

Cleveland, Ohio

## PRODUCTS

**Lyon Breathing Machine and Infant Breathing Machine.**

**"Everything in Safety for Safety."**

## THE LYON BREATHING MACHINE

This machine is a device that is instantly available in cases of poisoning from Gases, Ammonia, Fumes, Mine Accidents, Drowning, Electric Shock, Collapse from Anesthesia, Asphyxia of the New-born, etc. It requires no corrections or alterations, giving pure air under safe pressures, able to dislodge foreign matter from the mouth, nasal cavities and bronchial tubes, delivering same into the open air (or receptacle) in a satisfactory manner.

It is endorsed and in actual service by the Gas Defense Branch of the Chemical Warfare Division of the United States Government, which is the highest possible endorsement that can be given any instrument.

Having met the exacting demand of this Department it should be made a part of the Safety equipment of every Chemical plant.

Since saving life in emergency is a matter of seconds this device comes ready set up for operation, and requires no time in attaching tubes and face masks. This often means either success or failure.

The Lyon Breathing Machine is the only device of its kind on the market which can be sterilized.

The Lyon Breathing Machine is made entirely of aluminum, will not corrode, rust or tarnish. It is light

and strong, guaranteed against imperfections in construction, workmanship and material, and will last a lifetime. Simple directions accompany each outfit.

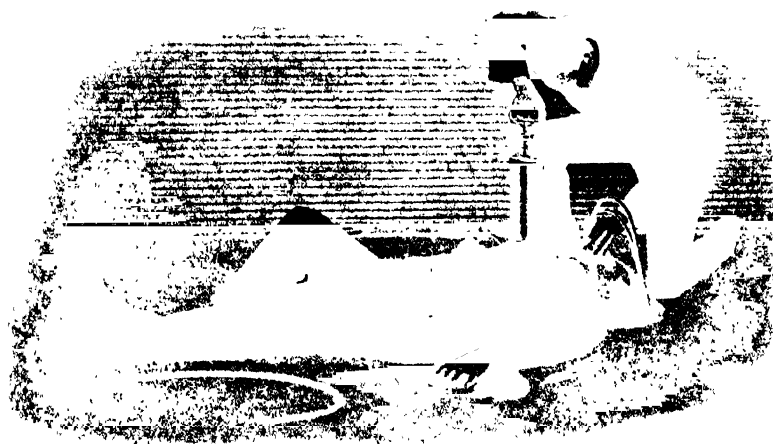
This device is further provided with an oxygen connection whereby varying quantities may be given from any type of container.

## THE INFANT BREATHING MACHINE

To supply popular demand an Infant Breathing Machine for use on babies at birth has been added to our line.

## PARTIAL LIST OF THOUSANDS OF USERS

Armour & Co.,  
American LaFrance Fire Engine Co.,  
Champion Coated Paper Company,  
Cleveland Railway Co.,  
City of Cleveland,  
Cincinnati General Hospital,  
Chemical War Service U. S. Government, Gas Defense Branch,  
Dayton Eng. Laboratories Co.,  
Ford Motor Company,  
Hydraulic Pressed Steel Co.,  
J. H. Foster, President Hydraulic Steel Co. (Private Grounds),  
McKinney Steel Company,  
Procter & Gamble Co.,  
Pyrene Manufacturing Co.,  
St. John's Hospital,  
York Haven Paper Co.



LYON BREATHING MACHINE IN ACTUAL USE

# HOAGLAND-THAYER, INC.

## Storage Battery Industrial Electric Trucks

300 WASHINGTON STREET, NEWARK, N. J.

### PRODUCT

The Hoagland-Thayer Industrial Electric Motor Truck.

### ELECTRIC WAREHOUSE TRUCKS

This type of material handling equipment is becoming more and more popular with those responsible for manufacturing costs.

Their flexibility of movement and load capacity enable them to reduce trucking costs which affect the ultimate cost of manufacture.

One Industrial Electric Truck will displace several hand trucks. At the same time it will make more trips over a given distance, carrying at least four times the load each single trip.

These trucks can go anywhere, across roadways, up grades steeper than a laborer can push or pull a hand truck, along cobble paved roadways.

A laborer of ordinary intelligence can operate one of these trucks after a few hours' practise.

### THE HOAGLAND-THAYER TRUCK

The most advanced practise in the use of electric power and the best engineering skill available, coupled with experience in operation, are all combined in the design and development of the Hoagland-Thayer Truck.

It is dependable, built for hard service, and will carry a load of 4,000 pounds.

The power is supplied by storage batteries and transmitted by front axle drive.

The Truck when light has a speed of from seven to eight miles, when loaded from five to six miles per hour, and will negotiate from 5 to 10% grades with full load.

The Truck is always under easy control and can be driven with equal facility either forward or reverse at slow, medium or high speeds, and turns in the smallest possible radius, steering by all four wheels.

The steel frame gives rigidity with the least possible weight. The axle construction permits the highest power efficiency and eliminates the use of sprockets and chain drive, which have a tendency to take up and cmesh any loose material which may be strewn over the line of travel.

The Trucks are built according to standards adopted by the Electric Vehicle Association of America.

The Truck can be readily dismantled. All parts are easily accessible.

The best workmanship and materials are used throughout.

### Specifications, Type "A" Truck

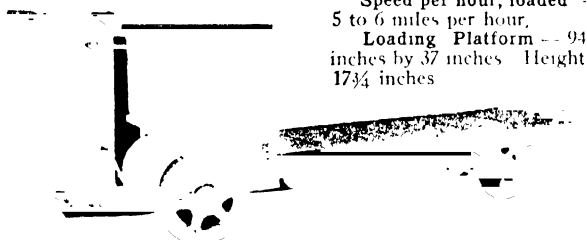
Loading Capacity—4,000 pounds.

Weight of Truck—2,085 pounds complete with battery.

Speed per hour, light—7 to 8 miles per hour.

Speed per hour, loaded—5 to 6 miles per hour.

Loading Platform—94 inches by 37 inches. Height 17¾ inches.



TYPE A TRUCK

Length Over Body 10 feet exclusive of operator's foot board.

Turning Radius 10 feet outside wheels.

Tread, Front 34 inches.

Tread, Rear 26 inches.

Wheel Base 78 inches.

Tires, Front 20 inches by 3½ inches Goodrich Solid Base.

Tires, Rear 15 inches by 3½ inches Goodrich Solid Base.

Battery 21 Cells A. C. Edison. Suspended on Springs, eliminating shock.

Motor 24 Volt, 40 Ampere, 1050 R. P. M. Motor, specially designed for vehicle service and Storage Batteries. Will take 150 amperes, 24 volts, for ten minutes without overheating. This high overload capacity permits high starting power and full load on reasonably heavy grades.

Controller Has three speeds forward and reverse with positive stop, automatic neutral and return check, and can be used without resistance.

Brake Royal Duplex on intermediate shaft. The driving gears are always locked when not in operation as the brake is automatically applied when the operator steps from the pedal.

Charging Plug E. V. A. Standard, 50 ampere, of the removable safety type.

Steering Four wheel horizontal lever control, giving the smallest turning radius possible.

Transmission Double reduction spur gearing with full floating axle, the weight of the car carried on housings eliminates all strains on axles except those incidental to driving. Brown Type differential with 3½ inch nickel steel gears and universal connection to driving wheels, completely enclosed and thoroughly dust and waterproof. Gears and differential running in oil.

Frame—Structural steel, hot riveted and thoroughly braced.

Platform Floor Hard wood.

Wheels, Axles, Knuckles Cast Steel.

Bearings Anti friction throughout (Annular Ball).

Intermediate Shaft 1½ inches Nickel Steel.

Driving Shaft 1½ inches Nickel Steel.

Oiling All moving parts equipped with oilers.

Painting To suit Buyer.

Operation—In starting, the position of the motor-man should be with the right hand on steering arm, the left on controller lever. The right foot on brake pedal.

To start, press pedal down, this releases brake and closes electrical circuit to controller which governs the power transmission. Then move controller lever downward for forward, and upward for reverse motion, holding at speed desired. First notch either way for slow, second medium, and third high speed. Releasing brings it to neutral, and cuts out current automatically.

Move steering arm in the desired direction, either right or left.

To stop, release Controller lever first, then raise foot from the pedal. The Controller lever returns to neutral as soon as the hand is removed.

Caution—Reversing the Controller lever while truck is in motion produces severe strain on mechanism, and should be avoided.

For emergency stops remove foot from pedal. This simultaneously shuts off the power and throws on the brake automatically.

If for any reason the motorman leaves the footboard the truck will automatically stop, as the pedal lever when released applies the maximum brake and cuts out the electric current.

Charging Cost—With a Public Service plant, giving 110 volts D. C., the current for charging the batteries for one truck would be from 25 to 35 Kilo Watt hours, at an average price of 4c. per K.W. hour, the cost would amount to from \$1.00 to \$1.40 per charge. With the use of a motor generator or rectifier this cost would be reduced one-half, as the loss incurred by the rheostat resistance would be avoided.

# THE HODGE BOILER WORKS

Steam Boilers and Steel Plate Construction

EAST BOSTON, MASS.

## PRODUCTS

Horizontal Return Tubular and Vertical Fire Tube Boilers; Locomotive and Marine Type Internally Fired Boilers.

Storage and Pressure Tanks of all types.

Steel Smokestacks, Smoke Flues and Standpipes.

Steel Plate Construction and Sheet Iron Work.

Vulcanizers, Digesters and Rendering Tanks.

## FACILITIES

**Equipment**—Our plant is fully equipped with modern tools and labor saving devices required for the economical fabrication of steam boilers and all forms of steel plate construction.

**Experience**—With over fifty-five years' experience in steel plate construction, we are able to guarantee intelligent execution of any work of this character. Many of our employees have devoted their lives to the service of this company and are unusually skilled mechanics, insuring the highest quality of workmanship to our patrons.

**Shipments**—The material required for the construction of standard horizontal return tubular and vertical boilers is carried in stock, as well as completed boilers of the sizes most frequently desired, making it possible for us to fill all orders promptly and in many cases to make immediate delivery.

## TANKS AND STEEL PLATE WORK

We build all types of tanks required for the chemical industries, such as digesters, vulcanizers, rendering tanks, soaking-out and storage tanks.

The location of our factory on the water front of Boston Harbor makes it possible for us to deliver, in completed form, tanks larger than can be handled conveniently as all rail shipments.

## HORIZONTAL RETURN TUBULAR BOILERS

**Externally Fired Type**—Boilers of the ordinary externally fired type are constructed for any desired working steam pressure in accordance with specifications to fulfil the requirements of the A.S.M.E., Boiler Code, the Massachusetts State Law or any local requirements.

These boilers are built in standard sizes ranging from 20 h.p. to 300 h.p., and are ordinarily furnished complete with the necessary fixtures and castings, including safety valve, steam gage and combination water column. (Piping for the fixtures not furnished unless specified.) Also binder bars, arch bars, cast iron fronts and stationary grates as required for the complete installation of the boiler.

If desired and specified, we are prepared to furnish the necessary framework and supports for the suspended form of setting.

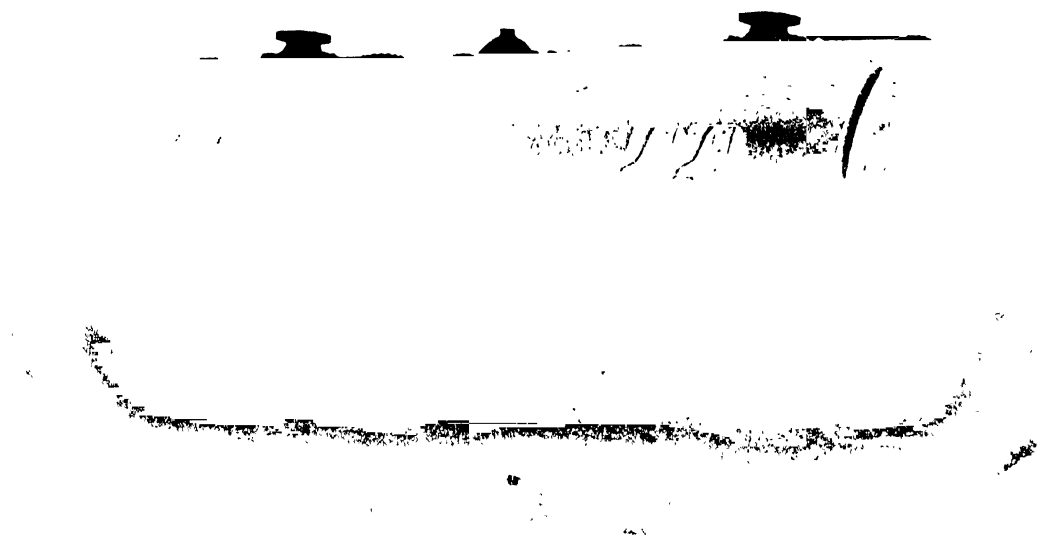
Castings for setting the boiler with either flush or vulcanizing front will be furnished as desired.

If required, we will furnish a complete set of drawings showing all the details regarding the setting for any particular case.

**Internally Fired Type**—We are prepared to furnish and recommend boilers of the internally fired horizontal return tubular type, with corrugated furnaces, for installations where the overload conditions are excessive or otherwise detrimental to the use of a brick set boiler.

Boilers of this type are particularly adapted for high pressure and possess all of the merits of Scotch Marine Boilers. The space required is also somewhat less than for boilers of the externally fired type.

These boilers can be furnished in sizes ranging from 50 h.p. to 300 h.p.



HORIZONTAL RETURN TUBULAR BOILER

# HODGES WATER STILL COMPANY, INC.

5713 Appletree St.  
PHILADELPHIA, PA.

## PRODUCTS

Water Stills, single effect and multiple effect; Salt Water Stills.

### HODGES SINGLE EFFECT STILLS

Made in 5 sizes, producing 5, 10, 15, 30 and 50 gallons of distilled water per hour. Specially adapted for laboratory work. Employed largely in storage batteries, and electrolytic preparation of oxygen and hydrogen.

### HODGES TWO EFFECT STILLS

In following sizes—75, 125, 225, 300, 500, 1000 and 2000 gallons of distilled water per hour. Will produce 3400 gallons of distilled water per ton of coal with modern boiler. Corresponding production from fuel oil according to quality.

### HODGES MULTIPLE STILLS

An extension of the two-effect principle to 3, 4 and 6 effects by the addition of condensing units. With each added effect an increasing amount of secondary steam is generated within the Still, economizing in size of boiler and amount of fuel. In a 3 effect Still one ton of coal will produce 4600 gallons of distilled water, in conjunction with a modern boiler; in a 4 effect 6800 gallons. A higher number of effects will economize correspondingly in fuel and boiler size.

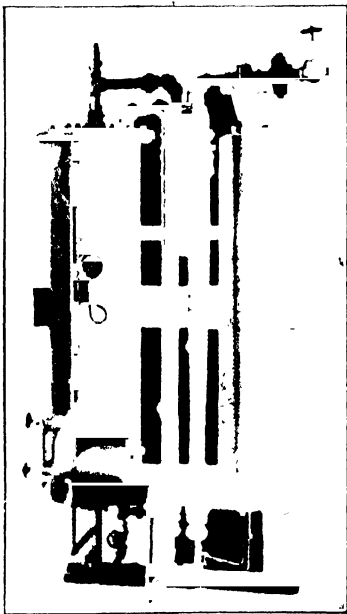
Hodges Stills operate with Live Steam direct from a boiler. The Still does not include a boiler, which is supplied by the purchaser.

### AUTOMATIC OPERATION

The intake of steam is automatically regulated by a steam-reducing valve, and the water by a water-trap. These being once set, the Still takes care of itself, requiring only to have valves opened and closed when starting or stopping.

### CLEANING

The removal of scale from the outside of condenser tubes is easily effected, as the tubes are straight and can be reached in place with an ordinary tube cleaner by lifting off the top cover.



HODGES SINGLE EFFECT STILL

## QUALITY OF DISTILLED WATER

Distilled water from a Hodges Still is entirely free from organic matter, living or dead. Mineral residue (lime, magnesia, chlorine, etc.) below two parts per million. Iron removed without trace. The constitution of the raw water does not matter, the distilled water having the same purity in all cases.

## PALATABILITY OF WATER

Perfectly distilled water is tasteless. The smoky taste of ordinary distilled water is due to the so-called "gases of distillation" which come over with the steam from the boiler. All raw water contains organic matter, some of which vaporizes at a lower temperature than steam and the vapor mingles with the steam. By the Hodges Patented Process the steam is re-condensed into distilled water at a temperature above the condensation point of these gases, which are piped off into the atmosphere, leaving a product as palatable as spring water.

## NO AERATION

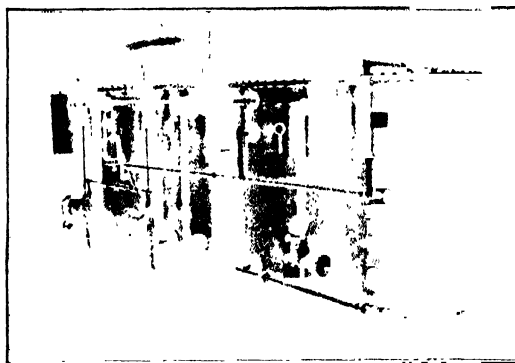
No aeration is employed in the Hodges Still to correct the taste of the water, no such correction being necessary. The distilled water is rigidly protected from all contact with air, and is consequently free from air—the most troublesome of impurities—and the other impurities which air contains.

## GUARANTEES

The purity and palatability of the distilled water and the capacity of the Still as rated are guaranteed.

## LITERATURE

General Catalog. Bulletins on Ice Manufacture. Bulletin on Vending of Distilled Water. List of Representative Users. Any of these furnished on application.



TYPICAL HODGES TWO EFFECT STILL

# ANTON HOFFMANN, INC.

## Manufacturer of Wooden Tanks, Vats and Drums

311-317 E. 91st Street

NEW YORK, N. Y.

### PRODUCTS

Wooden Tanks, Vats and Drums in any Shape  
for any Purpose.

Round  
Oval  
Square  
Rectangular

Single Tier  
Multiple Tier  
Partitioned  
Special Shaped

Agitator Tanks  
Pickling Tanks  
Platers' Tanks  
Pressure Tanks

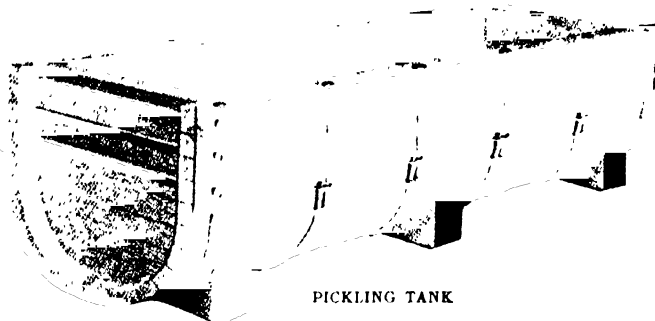
Platers' Polishing Drums  
Photographers' Tanks  
Filter Tanks  
X-ray Tanks

For Dyeing Tanks and Drums

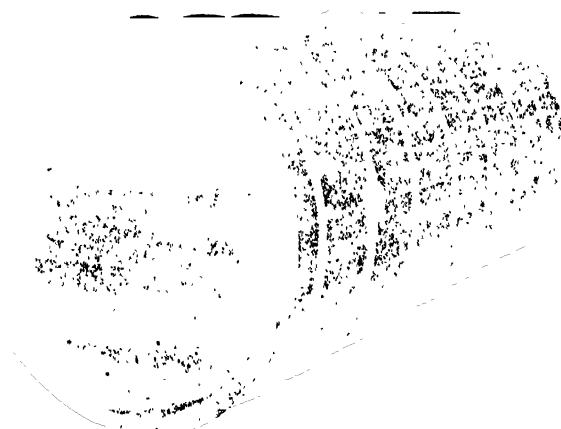
For

Chemical Plants  
Bleacheries  
Dye Houses  
Tanneries  
House Tanks

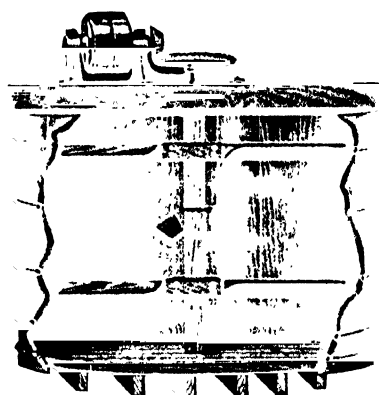
Color and Dye Manu-  
facturers  
Paint and Varnish Works  
Pulp and Paper Mills  
Beverage Manufacturers  
Sprinkler Systems



PICKLING TANK



PRESSURE TANK



AGITATOR TANK

### HOFFMANN SERVICE

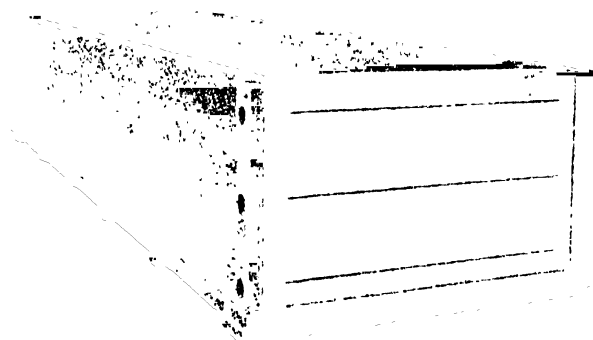
Our many years of experience in constructing tanks, vats and drums enables us to fulfill the requirements of the chemical and allied industries.

Long life is built into each tank or drum through the use of carefully selected, well seasoned wood, a large stock of which is always carried, thereby insuring prompt deliveries.

All work is done by competent, experienced men in accordance with the best modern practice. When specifications as to material, bracing, fitting, etc., are given by customer, they are followed explicitly. All orders receive prompt and careful attention.

Each tank is built as though it were a "special", this means special tanks. Vats or drums can be built to order within a reasonably short time.

When in need of tanks or drums Hoffmann Service is worthy of your careful consideration. Inquiries will receive prompt attention.



REGULATION RECTANGULAR TANK

# HOHMANN-NELSON COMPANY

Manufacturing Engineers

EAU CLAIRE, WIS., U. S. A.

TRADE  
**Honeco**  
MARK

## PRODUCTS

Thermometers for Industrial, Engineering, Laboratory and Chemical requirements; Recording Thermometers; Automatic Controllers, Airless and Air-operated types, for Temperature Pressure, Vacuum, Time and Condensate discharge; Thermo Steam Traps.

### HONECO INDUSTRIAL THERMOMETERS

The Mercurial Thermometers, so universally employed in all manufacturing and engineering operations, have been designed with the name "Hohmann" ever since their introduction, and the Honeco in the ultimate perfection of over 35 years of Thermometer development and progress, and are still manufactured under the direction of A. B. Hohmann, the man who originated them.

They are made in the various forms and sizes, that are now standard, provided with the fittings, attachments and features, that make them applicable for every possible requirement, and of scale ranges, from minus 40° to plus 1000° F., or equivalent.



"HONECO" INDUSTRIAL THERMOMETER

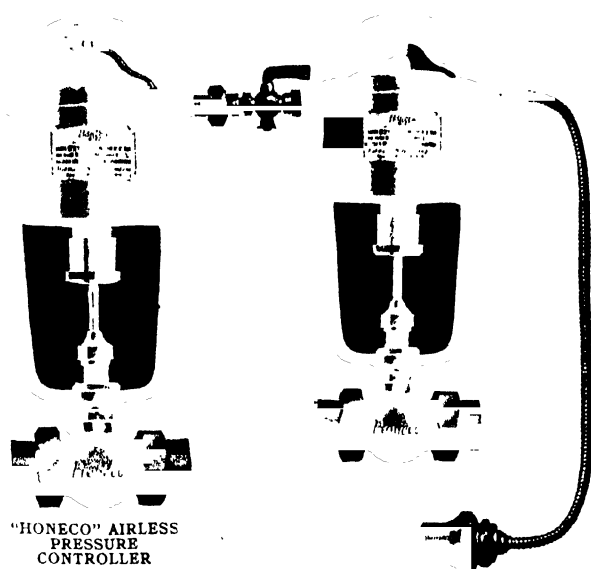
### RECORDING THERMOMETERS

Vapor tension and mercury actuated types, of self-contained and long distance forms, with various ranges, fittings, attachments and features for all requirements.

### HONECO AIRLESS CONTROLLERS

A Nelson creation, made only for controlling temperature and pressure, requiring no auxiliary motive power for operation, and the only self-contained Controllers that for many applications closely rival the air and water operated types, in ease and accuracy of adjustment, and closeness of control.

The operating ranges of the Temperature Controller are from plus 40° to plus 650° F., and the Pressure Controller from 1 to 150 pounds.



"HONECO" AIRLESS PRESSURE CONTROLLER

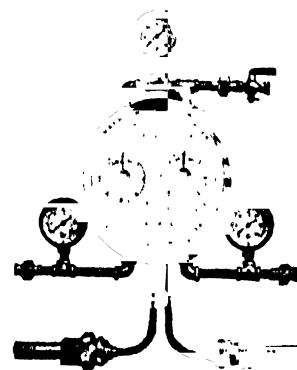
"HONECO" AIRLESS TEMPERATURE CONTROLLER

### HONECO AIR-OPERATED CONTROLLERS

Another Nelson invention, the distinctive feature of which is the valve in adjusting screw, accessible and removable from the front of the case without disturbing any connections, eliminating air valve and adjustment troubles, and insuring operation that surpasses all previous performance of air operated Controllers, for continuous satisfactory service.

These Controllers, in conjunction with Diaphragm Motor Valves as shown below, are made for controlling Temperature, Pressure, and Vacuum, the operating ranges of which are respectively Minus 40° to plus 750° F., the fraction of a pound to 400 pounds per square inch, 1/4 to 30 inches of mercury.

Also made for Time and Condensate Control, the former for automatically shutting off the heating or cooling medium, blowing off steam, admitting cooling water, ringing or lighting a signal, at the expiration of any time period for which the Controller is set, and the latter for discharging condensate, wet steam, and air, from steam apparatus, at any temperature or pressure, performing this service far more effectively than any steam trap.



"HONECO" TWIN TYPE AIR OPERATED TEMPERATURE CONTROLLER

### HONECO THERMO STEAM TRAP

Simple and compact and performs a service not possible with float and bucket type traps.

Has only one moving part, which is the powerful, indestructible and unchangeable motor, which operates without stress, strain or wear, on the unfailing thermal principle of expansion and contraction, effectively draining apparatus, coils, etc., of all condensation, wet steam and air, thereby insuring highest heating efficiency and also uniformity of temperature in steam heated spaces.

Suitable for pressures to 100 pounds, adjustable for any temperature to 350° F. and provided with valve opening of the same capacity as inlet and outlet.



"HONECO" THERMO STEAM TRAP



DIAPHRAGM MOTOR VALVE

# LUDWIG HOMMEL & CO.

Electric Appliances and Machinery

GENERAL OFFICES

530-534 FERNANDO STREET, PITTSBURGH, PA.

## PRODUCTS

### Silverman Illuminator for Microscopes.

## DESCRIPTION

The Silverman Illuminator is intended for use in microscopic examinations and for photographing opaque and semi opaque objects. It consists in principle of a circular source of light surrounding the objective and furnishing a diffused and uniform illumination directly on the spot to be examined.

In practice the circular source of light takes the form of a small, circular tube, electric lamp held in place around the objective by means of a holder, the proper current being supplied from the electric lighting circuit through a rheostat. Dry cells or a storage battery can also be used.

The illumination is derived from a tungsten lamp taking about 9 amperes at 135 volts for visual observation work and focusing, while during photographic exposure 106 amperes at 18 volts is applied through a rheostat suitably arranged. The lamp is made in plain (colorless) glass and daylight (blue) glass.

**Stage Adapter.** For certain work it is desirable to keep the illuminator in a fixed position. The stage adapter accomplishes this purpose. In the study of fatigue failures, slip bands, cleavage planes, etc., oblique rays are essential, and it is better to keep the light down low instead of having it moving up and down with the objective. The stage adapter is useful here as well as in low magnification work in which the objective is at a considerable distance from the specimen.

One very important application of the stage adapter lies in its use with the double objective type binocular microscope.

When it is desired to lower the illuminator into a hollow object and keep it stationary in a fixed position, the bent rod is exchanged for the regulation horizontal rod on the adapter.



SILVERMAN ILLUMINATOR

**Shutter.**—The shutter may be slipped into place inside and under the lamp. Its purpose is to cut off the light from about one-half of the light source, causing shadows to be cast by surface elevations of the specimen.

**Absorption Disk.** This is a specially made blackened brass disk with hole in center, intended to be laid on specimen, especially for low power work. It will prevent reflection of light into the microscope tube except from the spot under observation.

## SPECIAL CHARACTERISTICS

The Silverman Illuminator can be attached to any microscope, ready for service, in a few moments. The tedious relative adjustment of microscope and light source is eliminated.

It supplies a soft, steady light, free from glare. Owing to the diffusion of the light, a wealth of detail is visible. Eye fatigue is eliminated.

**Oblique Light.**—The Silverman Illuminator provides oblique illumination. Those portions of the field which are dark by vertical illumination are light under the Silverman Illuminator, and vice versa.

**Absence of Shadows.**—Its light is evenly distributed and shadows largely eliminated. This is valuable in the study of rough surfaced specimens. If desired, the shadows can be produced by the use of the shutter.

**Depth of Penetration.** Several users have favorably commented on the depth of penetration of the light without interfering shadow effects in the examination of surface cracks and on its power to light up the interior of small pores and slag pits on the surface of specimens.



STAGE ADAPTER ATTACHED TO BINOCULAR MICROSCOPE

## APPLICATION

The Silverman Illuminator can be attached to an objective supported by any single, double or triple objective holder of the old or new type. It can be used with any binocular microscope, single objective or double objective type.

**Range of Application.**—Good results are obtained with objectives up to 4 mm. inclusive, for visual observation and up to 8 mm. inclusive, for photographic work. It is very well suited for low power work, satisfactory photos having been taken with 60 mm. objectives.

**Photography.**—Objects to be photographed are placed on the stage in the usual way. The light intensity and quality are such that a camera without shutter or lenses may be attached to the tube of the microscope. With a 10X eye piece and 16 mm. or 32 mm. objective, an exposure of 20 seconds is usually ample.

## USES

The Silverman Illuminator finds application in practically every field of microscopy, such as:

Metallurgy	Steel and Iron	Linoleum Compositions
Metallography	Brasses and Bronzes	Vitreous Enamels
Mineralogy	Textiles	Refractories
Plant Pathology	Paper	Glass
Biology	Rubber	Abrasives
Pharmacy	Leather	Insulating Materials
Botany	Wood (effect of stains, etc.)	Fibroid



# HOHMANN-NELSON COMPANY

Manufacturing Engineers

EAU CLAIRE, WIS., U. S. A.

TRADE  
**Honeco**  
MARK

## PRODUCTS

Thermometers for Industrial, Engineering, Laboratory and Chemical requirements; Recording Thermometers; Automatic Controllers, Airless and Air-operated types, for Temperature Pressure, Vacuum, Time and Condensate discharge; Thermo Steam Traps.

### HONECO INDUSTRIAL THERMOMETERS

The Mercurial Thermometers, so universally employed in all manufacturing and engineering operations, have been designed with the name "Hohmann" ever since their introduction, and the Honeco in the ultimate perfection of over 35 years of Thermometer development and progress, and are still manufactured under the direction of A. B. Hohmann, the man who originated them.

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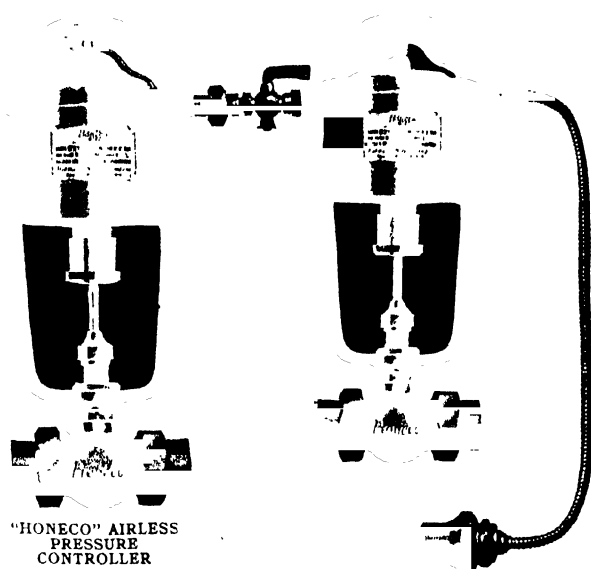
### RECORDING THERMOMETERS

Vapor tension and mercury actuated types, of self-contained and long distance forms, with various ranges, fittings, attachments and features for all requirements.

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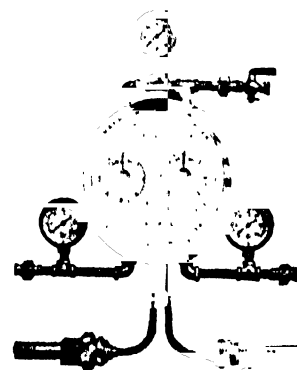
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DIAPHRAGM MOTOR VALVE

# LUDWIG HOMMEL & CO.

Electric Appliances and Machinery

GENERAL OFFICES

530-534 FERNANDO STREET, PITTSBURGH, PA.

## PRODUCTS

### Silverman Illuminator for Microscopes.

## DESCRIPTION

The Silverman Illuminator is intended for use in microscopic examinations and for photographing opaque and semi opaque objects. It consists in principle of a circular source of light surrounding the objective and furnishing a diffused and uniform illumination directly on the spot to be examined.

In practice the circular source of light takes the form of a small, circular tube, electric lamp held in place around the objective by means of a holder, the proper current being supplied from the electric lighting circuit through a rheostat. Dry cells or a storage battery can also be used.

The illumination is derived from a tungsten lamp taking about 9 amperes at 135 volts for visual observation work and focusing, while during photographic exposure 106 amperes at 18 volts is applied through a rheostat suitably arranged. The lamp is made in plain (colorless) glass and daylight (blue) glass.

**Stage Adapter.** For certain work it is desirable to keep the illuminator in a fixed position. The stage adapter accomplishes this purpose. In the study of fatigue failures, slip bands, cleavage planes, etc., oblique rays are essential, and it is better to keep the light down low instead of having it moving up and down with the objective. The stage adapter is useful here as well as in low magnification work in which the objective is at a considerable distance from the specimen.

One very important application of the stage adapter lies in its use with the double objective type binocular microscope.

When it is desired to lower the illuminator into a hollow object and keep it stationary in a fixed position, the bent rod is exchanged for the regulation horizontal rod on the adapter.



SILVERMAN ILLUMINATOR

**Shutter.**—The shutter may be slipped into place inside and under the lamp. Its purpose is to cut off the light from about one-half of the light source, causing shadows to be cast by surface elevations of the specimen.

**Absorption Disk.** This is a specially made blackened brass disk with hole in center, intended to be laid on specimen, especially for low power work. It will prevent reflection of light into the microscope tube except from the spot under observation.

## SPECIAL CHARACTERISTICS

The Silverman Illuminator can be attached to any microscope, ready for service, in a few moments. The tedious relative adjustment of microscope and light source is eliminated.

It supplies a soft, steady light, free from glare. Owing to the diffusion of the light, a wealth of detail is visible. Eye fatigue is eliminated.

**Oblique Light.**—The Silverman Illuminator provides oblique illumination. Those portions of the field which are dark by vertical illumination are light under the Silverman Illuminator, and vice versa.

**Absence of Shadows.**—Its light is evenly distributed and shadows largely eliminated. This is valuable in the study of rough surfaced specimens. If desired, the shadows can be produced by the use of the shutter.

**Depth of Penetration.** Several users have favorably commented on the depth of penetration of the light without interfering shadow effects in the examination of surface cracks and on its power to light up the interior of small pores and slag pits on the surface of specimens.



STAGE ADAPTER ATTACHED TO BINOCULAR MICROSCOPE

## APPLICATION

The Silverman Illuminator can be attached to an objective supported by any single, double or triple objective holder of the old or new type. It can be used with any binocular microscope, single objective or double objective type.

**Range of Application.**—Good results are obtained with objectives up to 4 mm. inclusive, for visual observation and up to 8 mm. inclusive, for photographic work. It is very well suited for low power work, satisfactory photos having been taken with 60 mm. objectives.

**Photography.**—Objects to be photographed are placed on the stage in the usual way. The light intensity and quality are such that a camera without shutter or lenses may be attached to the tube of the microscope. With a 10X eye piece and 16 mm. or 32 mm. objective, an exposure of 20 seconds is usually ample.

## USES

The Silverman Illuminator finds application in practically every field of microscopy, such as:

Metallurgy	Steel and Iron	Linoleum Compositions
Metallography	Brasses and Bronzes	Vitreous Enamels
Mineralogy	Textiles	Refractories
Plant Pathology	Paper	Glass
Biology	Rubber	Abrasives
Pharmacy	Leather	Insulating Materials
Botany	Wood (effect of stains, etc.)	Fibroid

# HOHMANN-NELSON COMPANY

Manufacturing Engineers

EAU CLAIRE, WIS., U. S. A.

TRADE  
**Honeco**  
MARK

## PRODUCTS

Thermometers for Industrial, Engineering, Laboratory and Chemical requirements; Recording Thermometers; Automatic Controllers, Airless and Air-operated types, for Temperature Pressure, Vacuum, Time and Condensate discharge; Thermo Steam Traps.

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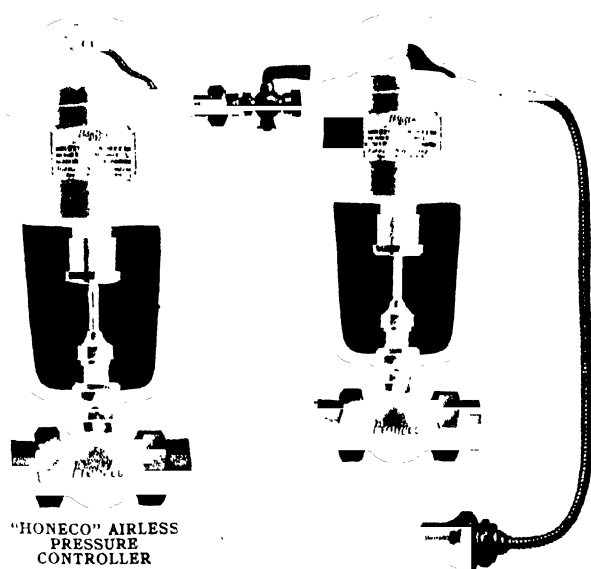
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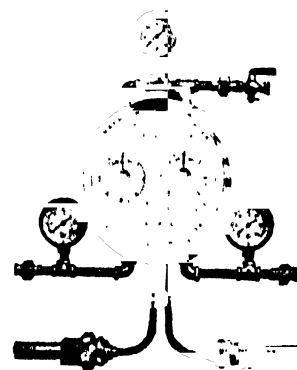
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DIAPHRAGM MOTOR VALVE

# HOPE ENGINEERING AND SUPPLY COMPANY

Consulting and Contracting Engineers

Pittsburgh, Pa.

MT. VERNON, OHIO

Tulsa, Okla.

## PRODUCTS AND SERVICES

Gas and Oil Engines  
Air and Gas Compressors  
Pipe Couplings for Threadless  
Pipe  
Heat Exchangers  
Absorbers  
Absorption Gasoline Plants  
Compression Gasoline Plants  
Oil and Gas Pipe Lines  
Power Plants  
Pumping Stations  
Compressing Plants  
Engineering Reports (Petroleum and Natural Gas)  
Gas Testing  
Gas Analysis



ABSORPTION PLANT FOR RECOVERY OF GASOLINE FROM NATURAL GAS

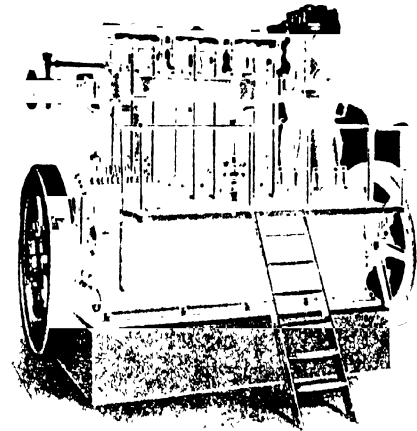
## REEVES GAS ENGINES

Vertical, multi-cylinder, four cycle type

These engines are built for use of Natural, Artificial or Producer Gas as well as Oil or Gasoline. They are highly efficient, closely regulated Power Producers with an unexcelled record for continuous service. In addition to the above qualities, the small floor space required and quiet running offer great advantages for driving generators in Office Buildings.

## REEVES COMPRESSORS

Are of the Vertical, Multi-cylinder type constructed in combination with the Gas, Oil or Steam Engine, having Power and Compressing Cylinders on the same bed, or as separate Compressor Units suited for short belt drive. All valves are of the Biplane Type and Cylinders designed for one stage or two stage compression.



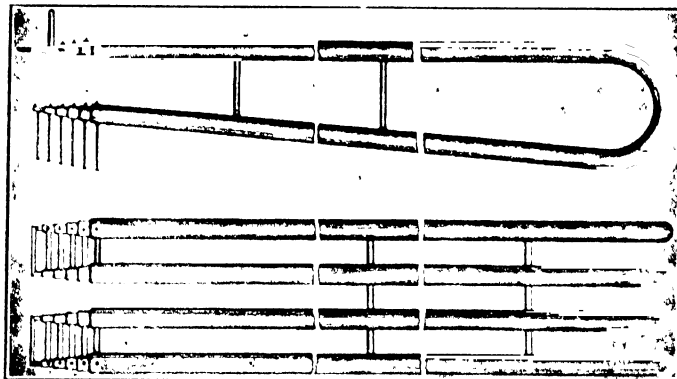
REEVES DIRECT CONNECTED GAS OR OIL ENGINE COMPRESSOR

## HEAT EXCHANGERS AND OIL COOLERS

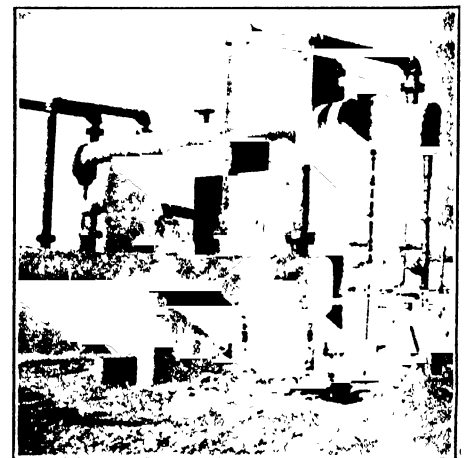
Heat Exchanger shown herewith has the following advantages over all other types:

High Velocity, as well as thin narrow streams of fluid

Complete insulation in itself without necessity of special insulating material



HEAT EXCHANGER



**ABSORBERS**  
Two sets of absorbers (in series) in gasoline extraction plant

# HOHMANN-NELSON COMPANY

Manufacturing Engineers

EAU CLAIRE, WIS., U. S. A.

TRADE  
**Honeco**  
MARK

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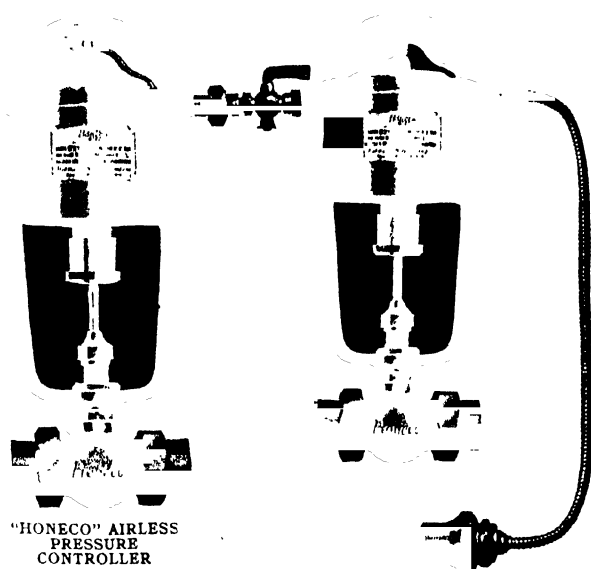
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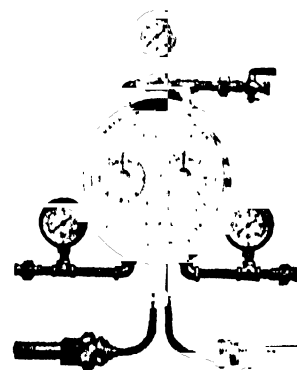
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DIAPHRAGM MOTOR VALVE

# HOSKINS MANUFACTURING COMPANY

*Chromel*

1155 Lawton Avenue  
DETROIT, MICHIGAN

**HOSKINS**  
—THERMAL LABORATORIES—

CHICAGO  
Over Bldg.

CLEVELAND  
Sheldon Bldg.

LOS ANGELES  
Truman Bldg.

NEW YORK  
Grand Central Terminal

PITTSBURGH  
Over Bldg.

SAN FRANCISCO  
Sheldon Bldg.

## PRODUCTS

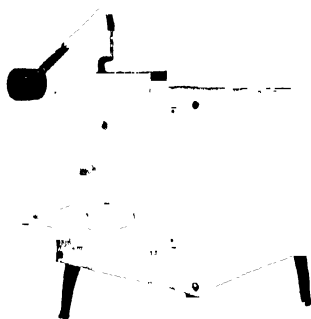
Electric Laboratory Furnaces  
Tool Furnaces  
Hot Plates  
Pyrometers  
Thermo—Couple Wire and Protecting Tubes

## FURNACES

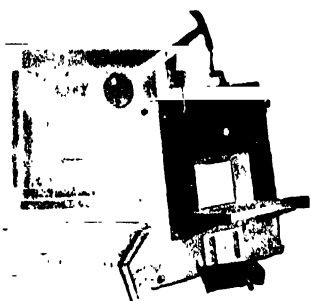
**Type FD**—This furnace is featured by the fact that **no part of it need be returned to the factory when repairs are needed.** On practically all sizes no cement coating is required to hold the resistance wire, the walls of the heating chamber being provided with spiral grooves in which the wire is wound. They are built in Muffle, Tube and Crucible designs.

The FD Furnaces are made for 110 or 220 volt circuits, alternating or direct current. All styles require use of rheostat. The maximum safe operating temperature is 1830° F. (1000° C.) Described completely in Hoskins Bulletin No. 13.

Note the ease with which the Type FD Furnace can be taken down. Disconnect the wires under the shelf, take out the four corner screws in the front-head, and all parts are readily accessible.



TYPE FD-204 MUFFLE FURNACE



KNOCK-DOWN OF MUFFLE FURNACE TYPE FD-204

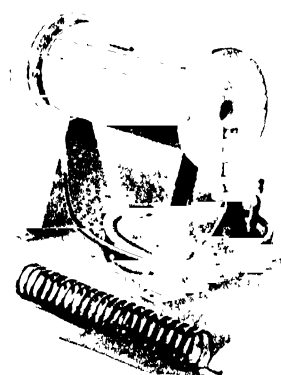
### TYPE FD FURNACE SIZES

Type No. Muffle	Size of Heating Chamber		
	W	D	L
FD 201	8"	4"	7"
202	10"	4"	10"
203	12"	4"	12"
204	14"	4"	14"
205	16"	4"	16"
206	18"	4"	18"
207	20"	4"	20"
* Multiple Combustion Furnace—5 holes			
Tube	Size of Heating Chamber		
	1 1/2" dia. x 12" long		
FD 202			
Crucible	Dia.		
	Depth		
FD 101	2"	2 1/2"	
103*	4"	4 1/2"	
104*	5"	5"	

\* Not regularly carried in stock

**Type FB**—These Furnaces are especially adapted to heavy duty or continuous operation, and are capable of 24-hr per-day service if required. They are made in Muffle, Crucible and Tube designs. In the muffle furnace, the heating units are in the form of hair-pins which entirely surround the heating chamber. In the Crucible and Tube furnaces, the heating unit is in the form of a coil which radiates the heat directly onto the furnace contents. All repairs can be easily made by the operator.

The FB Furnace is best operated on low voltage, alternating current circuits and requires a transformer. Maximum safe temperature is 2000° F. (1100° C.) See Hoskins Bulletin No. 80.



TUBE FURNACE TYPE FB-302

### TYPE FB FURNACE SIZES

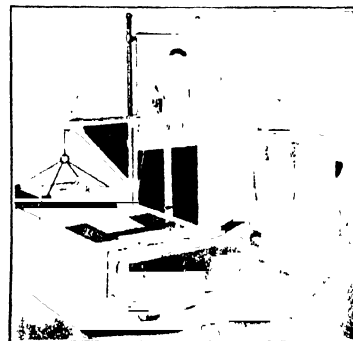
Type No. Muffle	Size of Heating Chamber †		
	W	D	L
FB 301	4 1/2"	3"	9"
302	5"	3"	12"
303	6"	3"	15"
304	8"	3"	18"
305	10"	3"	21"
306	12"	3"	24"
307	14"	3"	27"
308	16"	3"	30"
* Multiple Combustion Furnace—5 holes			
Tube	Size of Heating Chamber		
	1 1/2" dia. x 12" long		
FB 302			
Crucible	Dia.		
	Depth		
FB 102	2"	2 1/2"	
103	4"	4 1/2"	

\* Not regularly carried in stock

† Temperature regulation of Types FB 201 to 208 inclusive is by means of a regulating transformer. All others use a rheostat.

### Type FC High Temperature—

This is a crucible furnace for temperatures up to 1800° C. Operates on A. C. 110, 220 or 440 volts. Made in four sizes, ranging from 3" x 3" x 3 1/2" to 10" x 10" x 11". See Hoskins Bulletin No. 91.



HIGH TEMPERATURE FURNACE  
TYPE FC-103

Continued on Next Page

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Manufacturing Engineers

EAU CLAIRE, WIS., U. S. A.

TRADE  
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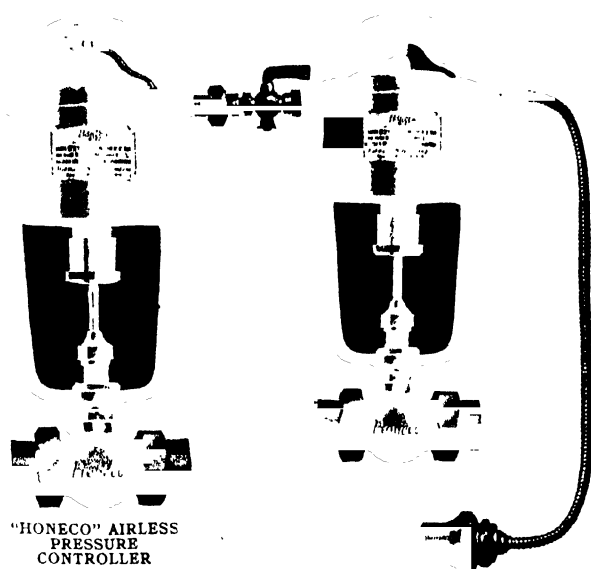
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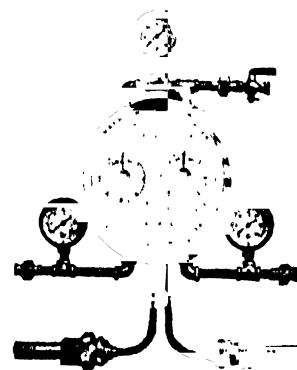
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DIAPHRAGM MOTOR VALVE

# THE HOTTMANN MACHINE CO.

Cutting and Mixing Machinery  
810 NOBLE ST., PHILADELPHIA, PA.

## PRODUCTS

Mixing Machinery for liquids, semi-liquids, pastes, powders and all materials requiring thorough mixing. The Hottmann Twin Screw Super Mixer.

Cutting and Mixing Machinery for the packing industry.

Machines for cutting, mixing and filling.

## USES

Our mixers are adapted to use in the following industries, as well as many others.

Asbestos  
Asphalt Compositions  
Candy, Chocolate, Chewing Gum  
Carborundum Mixtures  
Cement Mixtures  
Cork and Celluloid Compositions  
Color Mixers  
Crucible Mixtures, Duplicator Masses  
Enamels



**HOTTMANN CUTTER AND MIXER**

Showing Front Door and Side Outlet Open

Capacities 200 to 600 lbs. each charge. For cutting and mixing meat for sausage or for canning purposes. This machine does work which usually requires two machines.

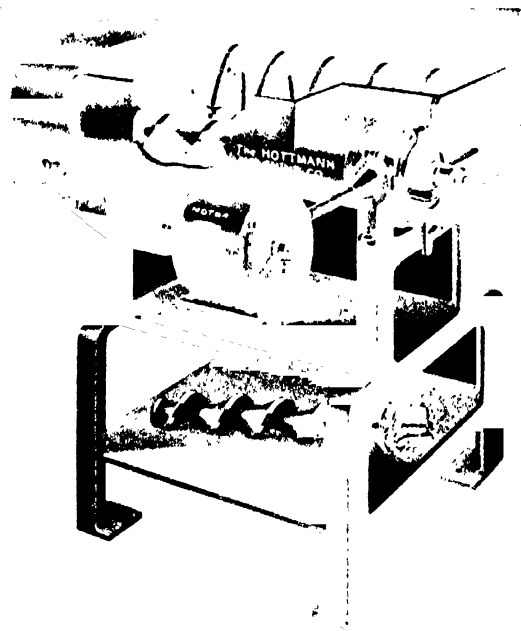
Graphite Compounds  
Inks, Printing and Lithograph  
Margarines  
Meat Mixtures  
Oils, Greases, Emulsions  
Paints, Varnishes, Putties  
Pastes, Powders, Polishes  
Pulps  
Photographic Film Mixtures  
Viscose

## TWIN SCREW SUPER MIXER

The principle of this machine is new, and its performance such as to insure the most intimate mixing of ingredients.

A pair of slow-moving mixing and kneading arms convey the product to a high-speed mixer and beater. The mixer and beater returns the material to the mixing and kneading arms, thus developing a complete cycle of performance heretofore unknown to the industries.

This action keeps every particle of the mass in constant, violent and irregular agitation, and allows no opportunity for dead spots in the mass, thus insuring mixtures which are complete and uniform.



**THE LATEST DEVELOPMENT COMBINING A NOVEL CUTTING, GRINDING, MIXING AND FILLING MACHINE**

This cuts, mixes, and automatically fills containers. By changing cutting blades to grinding blades, it will pulverize and mix nearly all products. Invaluable for experimental work, for laboratory work for handling small quantities, and to supplement the work of larger machines. Built in small sizes but designed for use in large sizes for quantity production. Simply turn a handle and this machine automatically discharges the finished product into containers.

By the addition of a steam jacket this mixer is adapted to the mixing of substances at elevated tem-



**THE HOTTMANN TWIN SCREW SUPER MIXER**

This machine combines two distinct mixing motions. A Slow speed Mixing and Kneading Movement and a High speed Mixing and Beating Operation, resulting in maximum production and efficiency. This new system always saves time and labor and in many cases improves the products.

peratures. It is built with or without this steam jacket.

This machine empties itself automatically, and is very easily cleaned. It is designed to give the most economical and satisfactory results.

Made in large and small sizes. Motor-driven, chain-driven, or belt-driven.



# HOHMANN-NELSON COMPANY

Manufacturing Engineers

EAU CLAIRE, WIS., U. S. A.

TRADE  
**Honeco**  
MARK

## PRODUCTS

Thermometers for Industrial, Engineering, Laboratory and Chemical requirements; Recording Thermometers; Automatic Controllers, Airless and Air-operated types, for Temperature Pressure, Vacuum, Time and Condensate discharge; Thermo Steam Traps.

### HONECO INDUSTRIAL THERMOMETERS

The Mercurial Thermometers, so universally employed in all manufacturing and engineering operations, have been designed with the name "Hohmann" ever since their introduction, and the Honeco in the ultimate perfection of over 35 years of Thermometer development and progress, and are still manufactured under the direction of A. B. Hohmann, the man who originated them.

They are made in the various forms and sizes, that are now standard, provided with the fittings, attachments and features, that make them applicable for every possible requirement, and of scale ranges, from minus 40° to plus 1000° F., or equivalent.



"HONECO" INDUSTRIAL THERMOMETER

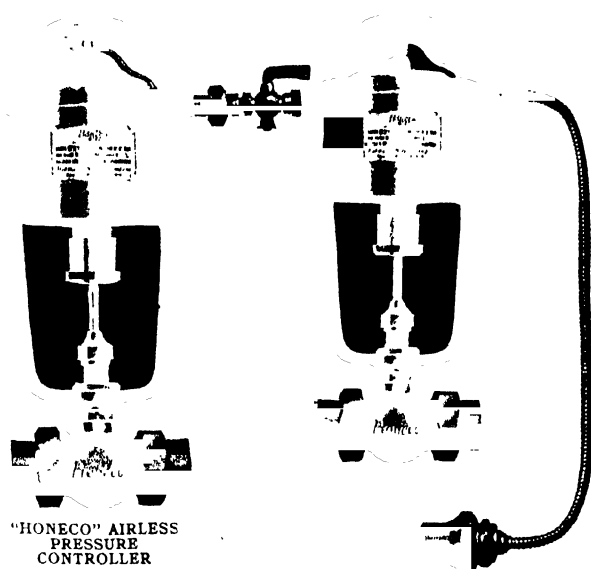
### RECORDING THERMOMETERS

Vapor tension and mercury actuated types, of self-contained and long distance forms, with various ranges, fittings, attachments and features for all requirements.

### HONECO AIRLESS CONTROLLERS

A Nelson creation, made only for controlling temperature and pressure, requiring no auxiliary motive power for operation, and the only self-contained Controllers that for many applications closely rival the air and water operated types, in ease and accuracy of adjustment, and closeness of control.

The operating ranges of the Temperature Controller are from plus 40° to plus 650° F., and the Pressure Controller from 1 to 150 pounds.



"HONECO" AIRLESS PRESSURE CONTROLLER

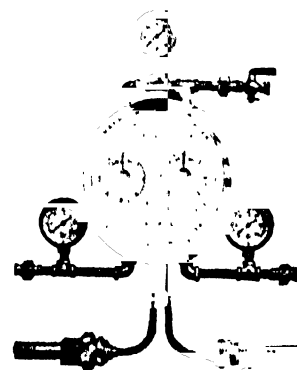
"HONECO" AIRLESS TEMPERATURE CONTROLLER

### HONECO AIR-OPERATED CONTROLLERS

Another Nelson invention, the distinctive feature of which is the valve in adjusting screw, accessible and removable from the front of the case without disturbing any connections, eliminating air valve and adjustment troubles, and insuring operation that surpasses all previous performance of air operated Controllers, for continuous satisfactory service.

These Controllers, in conjunction with Diaphragm Motor Valves as shown below, are made for controlling Temperature, Pressure, and Vacuum, the operating ranges of which are respectively Minus 40° to plus 750° F., the fraction of a pound to 400 pounds per square inch, 1/4 to 30 inches of mercury.

Also made for Time and Condensate Control, the former for automatically shutting off the heating or cooling medium, blowing off steam, admitting cooling water, ringing or lighting a signal, at the expiration of any time period for which the Controller is set, and the latter for discharging condensate, wet steam, and air, from steam apparatus, at any temperature or pressure, performing this service far more effectively than any steam trap.



"HONECO" TWIN TYPE AIR OPERATED TEMPERATURE CONTROLLER

### HONECO THERMO STEAM TRAP

Simple and compact and performs a service not possible with float and bucket type traps.

Has only one moving part, which is the powerful, indestructible and unchangeable motor, which operates without stress, strain or wear, on the unfailing thermal principle of expansion and contraction, effectively draining apparatus, coils, etc., of all condensation, wet steam and air, thereby insuring highest heating efficiency and also uniformity of temperature in steam heated spaces.

Suitable for pressures to 100 pounds, adjustable for any temperature to 350° F. and provided with valve opening of the same capacity as inlet and outlet.



"HONECO" THERMO STEAM TRAP



DIAPHRAGM MOTOR VALVE

# HOUCHIN-AIKEN COMPANY, INC.

Engineers and Machinists

Soap, Candle, Glycerine, and Chemical Machinery

113-123 FIFTY-THIRD STREET, BROOKLYN, N. Y.

Works: Hawthorne, N. J.

Shipping Point: North Paterson, N. J.

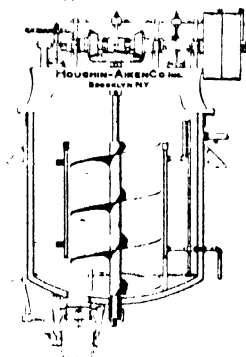
## PRODUCTS

Crutchers, Mixers, Remelters, Amalgamators, Plodders, Frames, Mills, Kettles, Cutters, Slabbers, Chippers, Soap Presses, Dies, Chemical and Special Equipment.

Plans, Specifications and Equipment for Complete Plants Furnished

## SOAP REMELTER

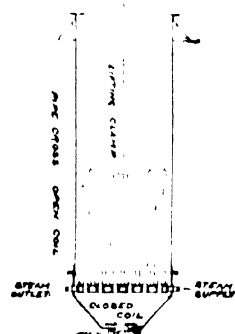
Coil consists of series of vertical pipes screwed in cast iron header, closed steam coil at outlet to keep soap from cooling.



PERFECTION JACKETED CRUTCHER

## STANDARD SOAP FRAME

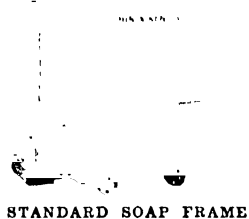
Skeleton ends, steel lined, sides No. 12 gauge steel, 1200 and 600 lb. sizes, with patent pivot plates for easy handling.



SOAP REMELTER

## PERFECTION JACKETED CRUTCHER

Adapted to all kinds of soap, jacket tested to 100 lbs. steam pressure, reversible clutch, 5 x 7 gate, enclosed gearing, 1500-6000 lb. capacity



STANDARD SOAP FRAME

## AIKEN POWER SLABBER

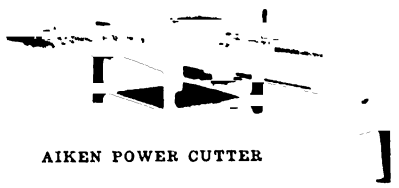
Worm drive, removable cutting heads, with motor or belt drive



AIKEN POWER SLABBER

## AIKEN POWER CUTTER

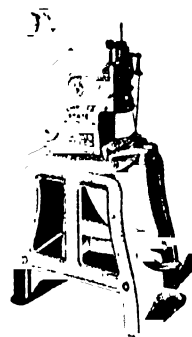
Of iron and steel, cutting heads removable, can be made to cut and stamp soap at same time.



AIKEN POWER CUTTER

## EMPIRE STATE PRESS

Foot power, capacity 20,000 cakes per day, floor space 2' x 3'



EMPIRE STATE PRESS



SOAP CHIPPER

## SOAP CHIPPERS

Capacity 2000 to 8000 lbs. per hour

## IDEAL AMALGAMATOR

This machine saves one milling and color and perfume are uniformly mixed with the soap, 250 lbs. per charge.



IDEAL AMALGAMATOR

## 2, 3, AND 4 ROLL SOAP MILLS

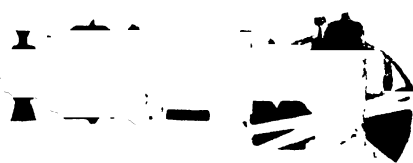
Granite rolls, bronze bearings, rolls ground on bearings and run true



2-3-4 ROLL SOAP MILL

## SCREW PLODDERS

4, 6, 8, 10, 12 inch screw, encased worm drive, runs in oil, capacities 500 - 18,000 lbs. per day.



SCREW PLODDER

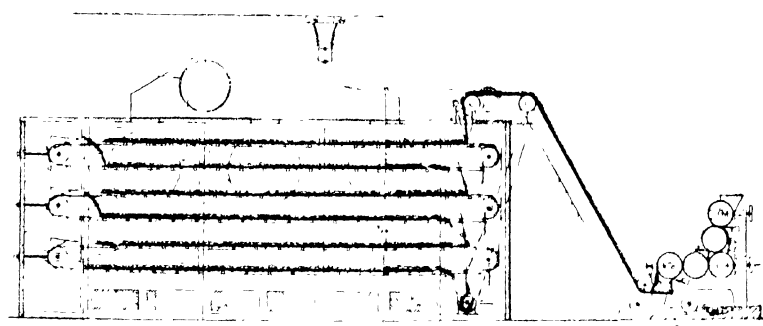
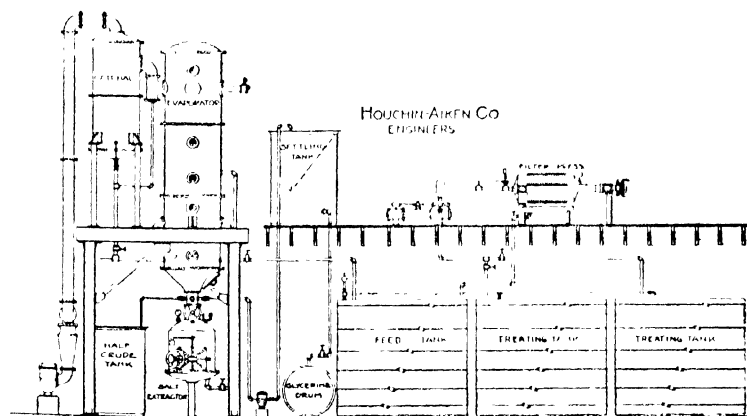
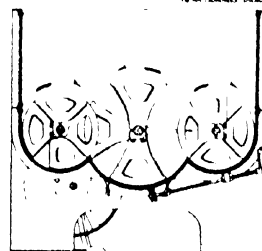
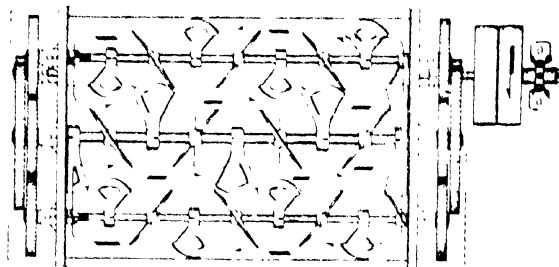
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**FIVE-ROLL FLAKE MILLS**

With chilled rolls, ground on bearings, to insure running, cut gears, can be fitted with a silent motor drive, used with a four-roll stone mill in tandem produce thin and transparent soap flakes.

**5 ROLL FLAKE MILL****H-A CONTINUOUS SOAP DRYER**

Unique patented design, uses both sides of aprons, 80% increased capacity, aprons of steel, will wear indefinitely, can be built in any size, cooling device if desired.

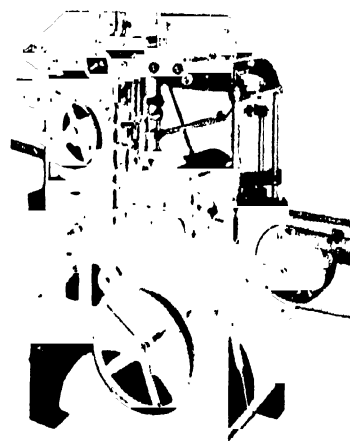
**H-A CONTINUOUS SOAP DRYER****CRUDE GLYCERINE RECOVERY PLANT****SIZE 12, CLASS II, 750 GALLON CAPACITY****B AND B PATENTED ULTRA-MIXER**

A machine possessing new and effective mixing principles, assuring a positive and uniform mixing of materials regardless of differences in specific gravity, viscosity, etc.

Due to the positive circulation, splitting up, shearing and cutting action of the unique shaped blades, during its course through the machine, as shown by the arrows in illustration, the material under treatment does not bunch, carry around with the shaft or possess any "dead spots."

It is equally effective on liquids, powders and pastes, making it a truly universal machine.

Sizes 2 1/2 to 2000 gallons, plain or jacketed.

**HIGH-SPEED WRAPPING MACHINE**  
150 Cakes per Minute of Laundry Soap

# NORMAN HUBBARD'S SONS

## Vacuum Pumps

265-7 Water Street  
BROOKLYN, N. Y.

### PRODUCTS

Improved "Packard" Vacuum Pumps.  
"Hubbard" Rotary Vacuum Pumps.

#### "PACKARD" VACUUM PUMPS

This pump is suitable for any operation where a high degree of vacuum is required. It has been designed to give the highest vacuum attainable without the use of water in the cylinders. Constructed for heavy continuous work when operating at the greatest possible speed.

Recent improvements have made the pump more suitable for quick exhaustion of vacuum closets or retorts than the old style of pump formerly used for this purpose. The "Packard" Vacuum Pump is meeting with pronounced success in the chemical industry when used in connection with vacuum pans.

The cylinders are placed vertically in a cast iron box which serves as a bed plate and water jacket, and on which the frame and working parts are mounted. The frame is exceedingly rigid, insuring smooth and easy running, all the parts are accessible, the bearing surfaces being of ample size and adjusted easily in case of wear. Each cylinder is entirely independent of the others and can be used separately or connected up, as required. The suction pipes are connected at the bottom of the jacket by means of valves which are provided with traps to arrest any dirt, and the exhausts are piped to a pot which acts as a trap to catch the oil used in lubricating the cylinders, this oil is thereby saved and may be used over again.

All the valves are opened and closed at the proper instant, automatically, not requiring an air pressure below them to do this work. The main valve stem does not pass through the piston head, as is usual with valves of this type. The piston packing is formed of hemp, which has been found, after numerous experiments, to give the best results, it is tight, wears well, and is easily and cheaply renewed when this becomes necessary.

The clearance in the cylinders is reduced to a minimum, being generally less than  $\frac{1}{16}$  of an inch, and no liquid is used other than sufficient oil to insure proper lubrication.

The valves in the piston head have their seats close to the bottom and are entirely included in the body of the piston. This construction makes it an impossibility for the valve to

break or fail. The exhaust valves are contained in a separate bonnet bolted to the cylinder head.

"Packard" Vacuum Pumps are constructed of the best material obtainable and the workmanship is first class in every respect. All parts are made to gauge and are interchangeable. The cylinders and valves are regularly furnished of iron but can be furnished of brass or composition to suit requirements.

Before shipment each pump undergoes a thorough test in actual operation. A mercury column is used to indicate the vacuum obtained, due notice being taken of the barometric pressure at the time of the test. We guarantee a vacuum of 29 $\frac{1}{2}$  inches (the barometer being at 30 inches), although a better result is generally obtained.

#### PRINCIPAL DIMENSIONS

All sizes are either in stock or in progress, and can be supplied promptly.

No.	Cyl.	Cyl. inches	Flange Port inches	Speed revolutions per minute	Pulley inches	Flange power	Free lift per cubic foot
Lab.	1	3" x 6"	10 x 12	85	18 x 3	1	2
0	1	4 $\frac{1}{2}$ x 6	12 x 12	150	20 x 4	1 $\frac{1}{2}$	6
1	2	4 $\frac{1}{2}$ x 6	18 x 18	115	24 x 4	1	11
2	2	8 $\frac{1}{2}$ x 8	20 x 24	110	28 x 4	1	22
3 A	3	8 $\frac{1}{2}$ x 8	24 x 24	100	28 x 4	1 $\frac{1}{2}$	30
4	3	11 $\frac{1}{2}$ x 6	18 x 22	110	24 x 4	1	16
5	3	7 $\frac{1}{2}$ x 9	26 x 36	75	36 x 6	3	35
6 A	3	7 $\frac{1}{2}$ x 9	26 x 36	70	36 x 6	4	50
6	2	12 $\frac{1}{2}$ x 12	48 x 60	60	36 x 9	6	94

#### "HUBBARD" ROTARY VACUUM PUMP

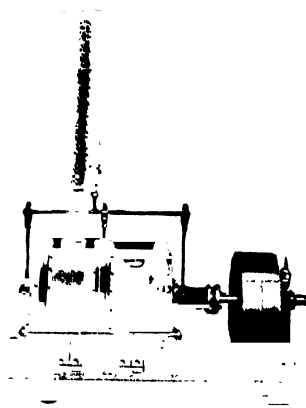
This pump is manufactured in single and double stage and can be arranged for any type of drive desired.

Designed for ordinary work not requiring vacuum over 28 to 29 inches. The double stage, or two cylinders connected in series, is used for work requiring very high vacuum and will show on mercury gauge, vacuum one-tenth of an inch ( $\frac{1}{10}$ " of the barometer reading.

One of these pumps (a small laboratory pump running in oil) in a test by the United States Department of Commerce produced a vacuum of 0.9 mm. or 0.035 ( $\frac{1}{28}$ ) inch.



NO. 2—IMPROVED "PACKARD" VACUUM PUMP  
Two 5 $\frac{1}{2}$ -in. cylinders, 8-in. stroke. Can be fitted for any drive desired.



"HUBBARD" TYPE "A" TWO STAGE ROTARY VACUUM PUMP

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## F. C. HUYCK & SONS

Kenwood Mills

ALBANY, N. Y.

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### PRODUCTS

Woolen Filter Cloths.

Paper Makers' Felts, Seamless Felts, and Kenwood

Tan Jackets.

Leather Press Tan Jackets or Wringer Felts.

Leather Board Felts.

Cushions or Bolsters for Setting Out Machines.

Felt Pads for Embossing Machines.

Sieve Cloths.

Bag-house Cloths.

### EXPERIENCE

The half century during which we have made woolen products for the American manufacturer has taught us the important requirements of these industries. It has enabled us to perfect and standardize our products for efficiency and for economy.

### SPECIAL CLOTHS

Where special requirements or problems arise, special cloths will be developed to meet the need. A competent research laboratory is maintained in the interests of the trade.

### KENWOOD WOOLEN FILTER CLOTHS

These cloths are adapted to all types of filtering

apparatus. They are standardized for strength and long wear and do not stretch or shrink.

### APPLICATIONS

Kenwood cloths are used in the refining of metals; manufacture of acids, explosives, salts of antimony, zinc, nickel, radium, vanadium and other inorganic salts, in the preparation of intermediates, acid dyes, medicines, and chemical products generally. Especially applicable to operations requiring very fine filtering media.

### SIZES

Kenwood Woolen Filter Cloths are furnished in any widths—preferably in rolls of 50-yard lengths.

### CORRESPONDENCE AND TRIAL ORDERS

Correspondence and trial orders are invited.

### PRICES

Will be quoted promptly on standard or special cloths.

### DELIVERIES

Prompt and uniform deliveries are guaranteed by large manufacturing facilities.

# C. W. HUNT COMPANY, INC.

Manufacturers of Industrial Railways and Coal Handling Machinery



GENERAL OFFICE AND WORKS  
WEST NEW BRIGHTON, N. Y.

REPRESENTATIVES

New York, N. Y. C. W. Hunt Engineering Corp.,  
141 Liberty Street  
Boston, 9, Mass. Ernest F. Learned,  
141 Milk Street

Chicago, Ill. Phillips, Tang & Company, Inc.  
518 South Dearborn Street  
Washington, D. C. James P. Mewshaw  
719 Fourteenth Street N. W.



## PRODUCTS

Industrial Railway Tracks; Switches; Motor Operated and Push Cars; Scales; Electric Mine and Industrial Locomotives; Cable Railways; Automatic Railways; Conveyors; Coal Crackers; Skip Hoists; Bin and Hopper Gates; Weighing Larries; Coal Tubs; "Stevedore" Manila Transmission and Hoisting Rope; Drilling Cable; Transmission Rope Couplings.

### INDUSTRIAL RAILWAY AND EQUIPMENT

**Tracks—Made Up—**Made in sections, 20 ft. long of standard light rails riveted to cupped or flat steel ties. Ties spaced  $21\frac{1}{2}$  in. centers and  $7\frac{1}{2}$  in. from ends. Special lengths to order.



FIG. 1—CAST PLATE STRAIGHT TRACK  
Sectional view

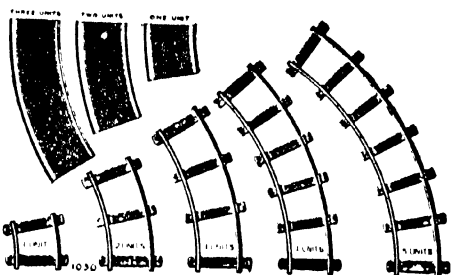


FIG. 2—ROLLED STEEL AND CAST PLATE CURVES



FIG. 3—LEFT-HAND SWITCH, WITH STAND



FIG. 4—TWO-WAY SWITCH

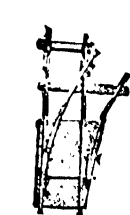


FIG. 5—RIGHT-HAND SWITCH



FIG. 6—POSITION OF TRUCK AXLES WHEN ROUNDING A CURVE



FIG. 7—THEORETICAL CONE AND CIRCULAR PATH BY AXLE AND WHEELS IN ROUNDING A CURVE

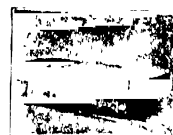
**Knocked Down—**Made in sections 15 ft. long of standard light rails, bolted up in field to special cross ties with clips and bolts. Special lengths to order.

**Cast Plate—**Track cast integral with plates and made in standard lengths up to 5 ft. (Fig. 1).

**Curves—**Hunt short radius curves are made with a special guard rail which in conjunction with Hunt special running gears eliminate friction when cars are rounding sharp curves (Figs. 2, 6 and 7).

**Switches—**Left-hand, right-hand, 2-way or 3-way, with or without stands. Also can be furnished in cast plate (Figs. 3, 4 and 5). Frogs, crossovers and turntables are also manufactured. Any workman of ordinary intelligence can put together a whole system ready for use.

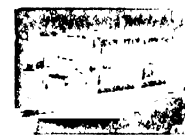
**Cars—**Bodies of various designs to meet a wide range of use, but all have essentially same truck construction. Axle bearings are either plain or roller bearing. Arrangement of running gear (Fig. 6) facilitates propulsion on short curves. Standard width for clearance of cars is 4 ft. Curve radius, 12 ft.



No. 011  
Standard Eight wheel  
Shop Car



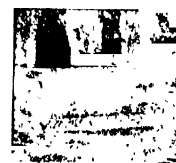
No. 0355  
Standard Charging  
Car



No. 07129  
Standard Four wheel  
Self dumping Push Car



No. 014  
Standard Tip Car



No. 0594  
Standard Shop Car



No. 0491  
Standard Foundry Car

FIG. 8—INDUSTRIAL RAILWAY CARS

**Track Scales—**Made in both iron and wooden frames, especially designed for use with industrial railway, track ends connecting directly with either cast plate track or made-up steel track of railway system.

**Electric Locomotives for Industrial and Mine Service—**Narrow gage electric locomotives in connection with industrial railways further reduce cost of handling material. Designed to take full load around 12-ft. radius curves as easily as on straight track.

Various types of locomotives are made to pull loads up to 50 tons.

Standard machine as shown (Fig. 9) is built for any track gage from 18 to 36 in. Minimum curve radius 10 ft. Rated draw bar pull, 800 lbs., at 4 miles per hour; steel wheels slip at 1600 lbs. starting pull.

Locomotives can be equipped with storage battery for motive power, or current can be taken from over-



FIG. 9—STANDARD ELECTRIC LOCOMOTIVE

*Continued on Next Page*

coal trolley or from third rail. Motors and gears are housed to protect them from injury and dust. Speed, variable, from 1 to 10 miles.

Also load carrying motor cars (Fig. 10), 1-ton to 10-ton capacities.

### HUNT'S AUTOMATIC RAILWAY

Designed primarily for transporting coal, sand, rock, cement and similar bulk materials from railway cars or vessels to storage bins where run does not exceed 600 ft. Operation is entirely automatic. Time consumed for round trip of 300 ft., dumping its load and returning, is about 50 seconds. Requires services of only one man—the crane man.

In operation, loaded car is started down an inclined track, and a few feet ahead of discharging point picks up a cross bar which is attached to a cable leading to a weight box. This raises weight box, and when load is discharged from car the reaction due to falling weight returns empty car to loading point.

Two sizes of cars are manufactured—1-ton and 2-ton capacity. Made of wood, lined with sheet steel.

### CABLE RAILWAYS

Adapted for handling coal and for carrying heavy material from point to point. Used extensively in conveying coal from barge to storage bins. Standard gage, 21½ in.; curve radius, 12 ft.

### SKIP HOISTS

Consists of load-carrying bucket, wire hoisting rope, head and leading sheaves, electric single drum hoisting engine with motor, traveling cam control and electrically operated brake, bucket guides, loading pit valve or loading chute, control panel and push button station for operating machine.

Single bucket skip is counterweighted and guides constructed for properly guiding counterweight and bucket. Electric skips with drum type controller and steam hoist friction operated skips of high speed can be furnished if desired. Skip hoist can be operated equally well whether vertical or inclined. Capacities from 25 to 300 tons per hour.

### OVERHEAD WEIGHING LARRIES

Built to meet existing conditions with one way or bifurcated chutes to serve a single or double line of stoker hoppers. Accurate records of coal consumption registered on cards. Manually or electrically operated either from boiler room floor or cab. Capacities ½ ton and up.

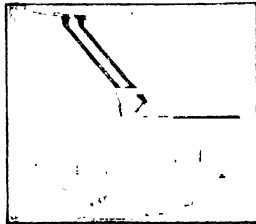


FIG. 10—MOTOR DRIVEN SELF-DUMPING CAR

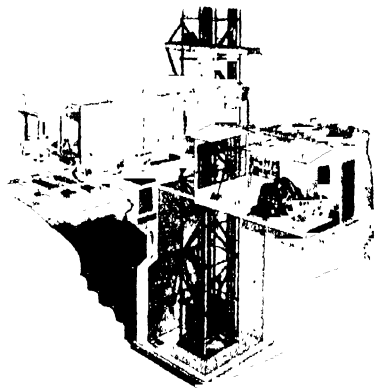


FIG. 11—STANDARD SKIP HOIST

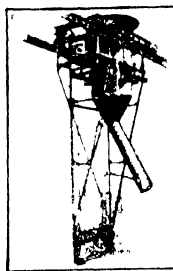


FIG. 12—OVERHEAD WEIGHING LARRY

### CONVEYORS

The Hunt pivoted bucket conveyor carries bulk material, dry or liquid, noiselessly in any direction without shock, breakage or violence. Three types of conveyors are manufactured:

"Standard," with independent buckets, being separately filled; "Continuous," with edges of buckets in contact; "Tip Type," with edges of buckets overlapping—material being spouted into conveyor in constant stream without spill or scatter.

Buckets are suspended on pivots so that gravity keeps them upright whether track be horizontal, vertical or inclined. Conveyor driven by pawls which run smoothly on driving pins on chains. Whole conveyor designed for thorough lubrication of all bearings.

All parts interchangeable. Conveyor will operate on 5 to 10 h. p.

Special automatic machinery is designed for filling each "Standard" type bucket with definite quantity of material. Several fillers can be arranged for measuring and mixing different materials.

### CUT-OFF VALVES OR GATES

For controlling flow of coal, broken stone, sand, etc., from storage bins to mechanical stokers, mixers or cars. Installed at side or bottom of bins, or at end of spout. Hand operated by single lever, but power can be applied to larger sizes. Have no sliding parts, but jaws rotate on centers, cutting through material without jamming. Normal tendency of valve is to close automatically by gravity. Almost every requirement may be met with standard types or modifications.

Fig. 16 shows a low body duplex valve with outside flanges particularly suitable for ash hoppers. If the conditions are unfavorable for the operation of any other type of cut-off valve, these duplex valves will be successful. They are heavily built and are not quickly burned out.



FIG. 13—SECTION THROUGH A POWER PLANT EQUIPPED WITH HUNT CONVEYOR



FIG. 14—CUT-OFF VALVES

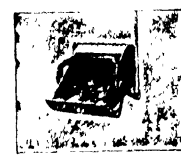


FIG. 15—VALVES AND CHUTES



FIG. 16—LOW BODY DUPLEX VALVE

# HYATT ROLLER BEARING COMPANY

NEW YORK, N. Y.

## PRODUCTS

Roller bearings for mine cars, countershafts, service cars, trucks of all kinds, cranes, trolleys and hoists, steel mill equipment, concrete mixers, textile machinery, conveyors, etc.

## HYATT LINE SHAFT ROLLER BEARINGS

The widespread need for increased efficiency in production has caused more attention to be paid to the power savings made possible by reducing the friction of moving parts of machinery. The perfection of anti-friction bearings has eliminated a large percentage of the power waste caused by ordinary friction bearings.

The true rolling motion of the Hyatt Line Shaft Roller Bearing eliminates at least 50% of the friction that exists in plain bab-bitted bearings, making possible a reduction of 15% of the total power. By the use of Hyatt Line Shaft Roller Bearings;

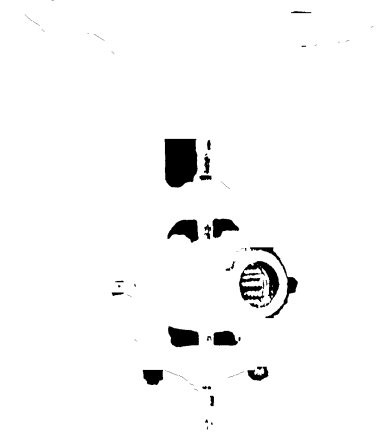
therefore, you can either increase your present equipment without enlarging your power plant or you can effect a 15% reduction in your power bill—a saving of special importance at this time.

Hyatt Line Shaft Roller Bearings are made for all standard sizes of shafting and being split can be shipped into position without removing pulleys, couplings or hangers. The boxes are filled with oil, after which they need not be lubricated for another four months.

The bearing itself consists of a series of flexible rollers of chrome-vanadium steel, retained in position by a substantial steel cage. Being hollow and having helical openings throughout their length, the rollers continually cover all bearing surfaces with oil.

Hyatt Line Shaft Roller Bearings are sturdily and accurately constructed and give satisfactory service year in and year out. There are many of them still in operation after 25 to 30 years of practical service—earning dividends through savings in power, oil and labor.

Install Hyatt Line Shaft Roller Bearings in your present hangers and on all new equipment. Save power, oil and attention. Our Line Shaft Bulletin containing prices and sizes of boxes and hangers and engineering data will be of real value to you.



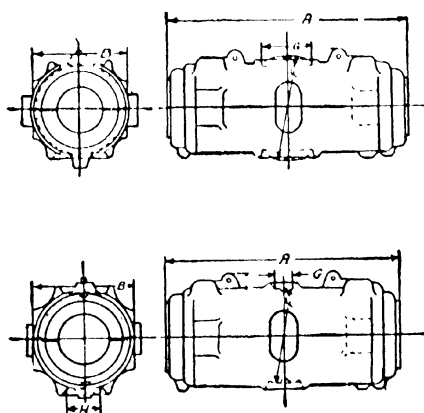
**HYATT LINE SHAFT BEARING**  
Mounted in a Standard 4-Point Set Screw Hanger



**HYATT LINE SHAFT BEARING**  
Mounted in a Pioneer Steel Hanger

## DIMENSIONS OF HYATT STANDARD BEARINGS

Either U-G or B. & S. bearings may be used in Hyatt 4-point set screw hangers and others with sufficient frame openings



Diam. of Shaft, In.	Approx. Weight, Lbs.	A		B		F		G		H
		BS	UG	BS	UG	BS	UG	BS	UG	
1 1/8	11	8 1/4	8 1/4	3 5/8	3 5/8	3 3/4	3 3/4	1 1/2	1 1/2	1 1/2
1 1/4	14	9 1/4	9 1/4	3 5/8	3 5/8	3 3/4	4	1 1/2	1 1/2	1 1/4
1 1/2	22	10 1/2	10 1/2	4	4	4 1/2	4 1/2	2 1/2	1 3/4	2 3/8
1 3/4	27	11 1/2	11 1/2	4 1/4	4 1/4	5	5	2 1/2	1 3/4	2 3/8
2	38	13	13	5	5	5 5/8	5 5/8	3	1 3/4	2 3/8
2 1/8	46	14	14	5 3/8	5 3/8	6	6	3	1 3/4	2 3/8
2 1/4	60	15 1/4	15 1/4	5 3/8	5 3/8	6 1/2	6 1/2	3 1/2	2 1/4	2 1/2
2 3/8	67	16 1/2	16 1/2	6 1/2	6 1/2	6 1/2	6 1/2	3 1/2	2 1/4	2 1/2
2 1/2	110	17 1/4	17 1/4	7 1/4	7 1/4	7 1/4	7 3/4	3 3/4	2 1/4	2 1/2
3	182	19 1/2	19 1/2	8 1/4	8 1/4	10 1/2	10 1/2	4 1/2	2 3/4	3 3/8
3 1/8	230	20	20	8 3/4	8 3/4	10 1/2	9 3/4	5 1/2	2 3/4	3
3 1/4	280	22 1/4	22 1/4	9 1/4	9 1/4	10 1/2	10	5 1/2	2 3/4	3
3 3/8	330	24 1/2	24 1/2	10	10	10 1/2	10	6 1/2	2 3/4	3
4	380	26 1/4	26 1/4	10 3/4	10 3/4	12	12	6 1/2	2 3/4	3
4 1/8	500	30	30	12	12	12 1/2	12 1/2	6 1/2	2 3/4	3



# INDEPENDENT FILTER PRESS CO., INC.

Manufacturers of

Filter Presses for the Chemical Industries

GENERAL OFFICES AND WORKS

118 THIRD AVENUE, BROOKLYN, N. Y.

## PRODUCTS

Filter presses, of Wood and Iron, for all Chemical and Allied Industries.

### INDEPENDENT FILTER PRESS

This press has been on the market for a number of years and is being used by an increasing number of chemical manufacturers who demand a "long life" press and at the same time one that is low in first cost. First-class workmanship in the construction of the entire press makes its claim to long life, efficient manufacturing methods make it a low first cost apparatus.

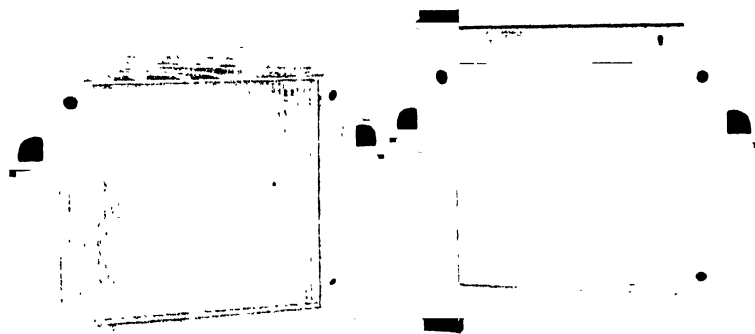
The Independent Filter Press is successfully employed for the filtration of liquors of varying physical and chemical characteristics, including alkaline, acid and neutral solutions. It is built to stand up under hard usage. The press frame proper is constructed of the finest grade cast iron and steel.

Each press is provided with an improved ratchet and thrust block for quick and economical operation. It is only necessary to draw the pressure screw back 1 or 2 inches when the thrust block can be pushed aside and the follower then drawn back. Our larger presses are equipped with a gear and pinion closing

for forming cakes up to 3" thick. Constructed either for the washing or non-washing of the solid matter with open or closed delivery.

**Type B**—Square center feed, Recessed Type for forming cakes up to 1½" thick. Constructed either for washing or non-washing of the solid matter with open or closed delivery.

Closed delivery presses are used for volatile liquids.



"INDEFILCO" PATENTED IMPROVED MOVABLE FIELD PLATE  
Patent No. 1,252,414

### IMPROVED TYPE FILTER PLATE

The features of this type of plate are entirely new and were developed by us to meet certain filtering conditions caused by warping and swelling of the ordinary type of plate. Our improved and patented plate is made with a movable field set in a rigid frame. This type of construction prevents warping and swelling. It eliminates leakage and assures proper alignment of feed and wash channels.

### LABORATORY FILTER PRESSES

We build special laboratory types in wood or iron for industrial research laboratories. Many of these types are carried in stock.

### FILTER CLOTH

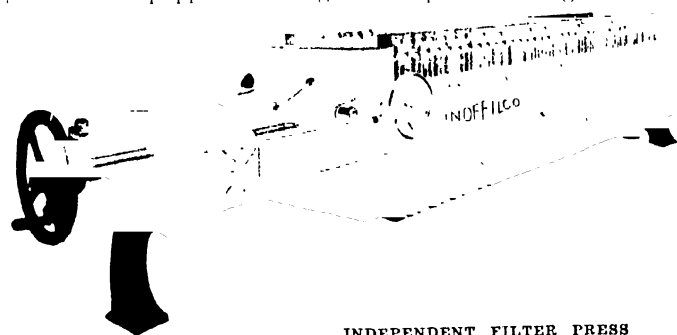
Our filter cloth department will gladly recommend the kind of cloth adapted for your purpose. Prices for filter cloth sent on application.

### TEST DEPARTMENT

We have a department devoted to the running of tests of any fluid. Our engineering department will at all times be pleased to cooperate with prospective clients in solving their filtration problems.

### CATALOGS

Catalogs and table of capacities sent upon application.



INDEPENDENT FILTER PRESS

device geared 4 to 1, thereby increasing the closing power in that proportion.

Plates and frames are constructed of the best lumber obtainable in Yellow Pine, Maple or Cypress. Liner pipes through the heads of the presses are of lead, iron or bronze to suit the conditions.

### TYPES OF PRESSES

**Type A**—Square corner feed, Plate and Frame Type

# INDUSTRIAL FILTRATION CORPORATION

Manufacturers of Filters for all Chemical-Industrial Uses

GENERAL OFFICES

115 Broadway, NEW YORK, N. Y.

LABORATORIES

22 E. 16th St., NEW YORK, N. Y.

## PRODUCTS

Zenith Open Tank Filters,  
Standard, acid resistant and alkali resistant  
Zenith Continuous Rotary Filters,  
Single and multiple compartment, alkali resistant  
and acid resistant, high and low containers  
Zenith Continuous Rotary Hopper Dewaterers,  
Standard, alkali resistant and acid resistant  
Special Filtering Apparatus,  
Special materials and special construction.

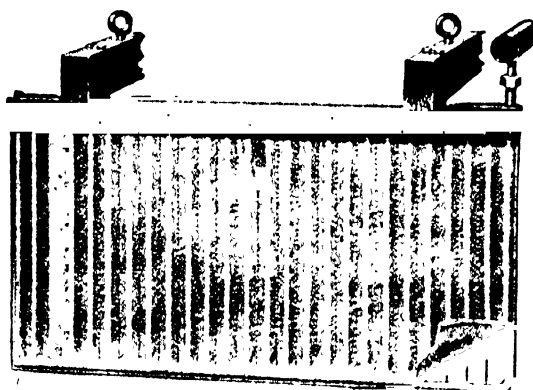
## OPEN TANK FILTERS

These filters consist of two or more filtering leaves or cells connected together in the form of a basket, attached to a common header, in conjunction with a movable hoisting device, and one or more open tanks (depending upon the washing requirements).

The simple design of this type of filter, well known for its labor saving and positive washing features, makes it possible to construct it with the minimum metallic contact. The tanks may be made of wood or may be lead lined and the filter leaves may be made of wood strips, cocoa matting, etc., drainage members, with outlet pipes, of lead, hard rubber, etc.

When metallic filter cloth is used as the filtering medium, the immense filter area obtainable per unit floor space commends this filter as a clarifier for caustic alkali liquors.

**Operation** Suction is applied to the interior of the basket of leaves submerged in a loading tank. The clear filtrate is drawn through the filtering medium, pipe and header, from whence it collects in a vacuum



(Patented)  
SINGLE LEAF

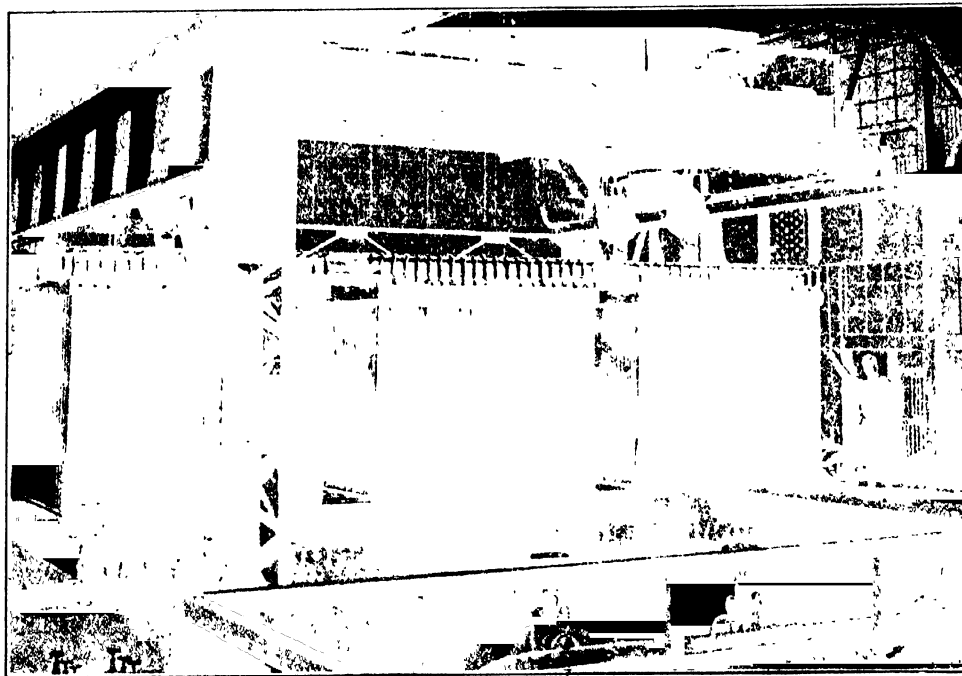
receiving tank and is discharged continuously either through a barometric leg or by a rotary pump located below the receiving tank. The solids collect in the form of a cake on the outside of the filtering medium, the surface of which is uniformly resistant. Therefore, when the leaves are removed from the loading tank and submerged in a tank of wash water, they are impoverished of the entrained soluble matter with marked efficiency. To discharge the solids the leaves are removed from the washing tank and suspended over the mud collecting hopper. The suction is then turned off and compressed air or steam is applied to the interior of

the leaves causing the solids to fall by gravity.

**Adaptations**—Aluminum Hydrate, Barium Sulphate, Calcium Phosphate, Calcium Silicate, Calcium Sulphate, Dye Intermediates, Epsom Salts, Feldspar, Frying Oils, Insecticides, Iron Hydrates, Manganese Dioxide, Syrups, Uric Acid, Slimes, Cobalt Oxide, etc.

### Features—

1. Inspection and control of solution at all times.
2. Flexible and elastic design of apparatus.
3. Large expanse of filtering area at small initial cost.
4. Increased capacity of filter at low additional expense.
5. The most thorough and economical method of washing known.
6. Very low operative costs.
7. Immediate and automatic discharge; no scraping of cake.
8. May be constructed in any size desired.



LEAF TYPE  
Large Installation, 11,000 Sq. Ft. Active Filtering Surface

(Patented)

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**ZENITH CONTINUOUS ROTARY FILTERS**

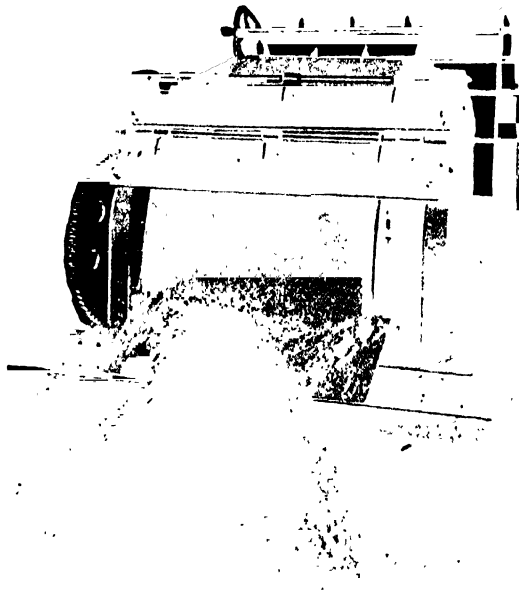
This machine consists of a drum revolving in a container filled with the slurry to be filtered. The periphery of the drum is divided into separate compartments, each covered with a filtering medium. Each compartment is connected by piping to the cored valve hub, the face of which is ground to bear against the valve cap. The valve cap is so designed that during a complete revolution each cored opening in the hub registers with the filtrate suction port, the washed liquid port, and the compressed air or steam inlet port.



(Patented)  
**ZENITH CONTINUOUS ROTARY FILTER**

Through the maintenance of a constant level and thorough agitation a uniform mixture is retained in the container at all times.

Zenith Rotary Filters are strongly and substantially constructed, capable of withstanding the hard usage encountered in every day service of the chemical and allied industries.



Ample drainage and pipe areas are provided, thereby securing the maximum filtering force at the filtering medium. All details of the design have been worked out in the light of our extended experience in handling numerous filtration problems.

We have numerous installations of these machines working on acid liquors and on caustic limes besides a great number of neutral solutions.

**Operation** As the drum rotates suction is automatically applied to each compartment as that compartment dips into the slurry, and is kept on to the point of discharge. The clear filtrate is drawn through the filtering medium, compartments and the valve to the desired point, leaving the solids deposited upon the surface of the drum in a cake of uniform thickness and porosity, which cake is automatically discharged over the scraper. Washing is accomplished by means of spraying the wash water upon the surface of the cake. Thus during every revolution of the drum the solids are picked up, washed, dried and discharged—all automatically and continuously.

The expensive labor of cleaning and operating presses is here eliminated, the life of the filtering medium is greatly extended as there is no abrasion or strain on the cloths and the loss and danger from leaky presses are



(Patented)  
**ZENITH CONTINUOUS ROTARY FILTERS IN CONSTRUCTION**

obviated. This in addition to the low cost of operation and small items of repair and renewal make Zenith Rotary Filters the most efficient machines for the materials for which they are adapted.

**Adaptations** Barbatine, Barhouse Dust, Barium Carbonate, Barytes, Bicarbonate of Soda, Calcium Carbide, Calcium Carbonate, Cement Slurry, Coal Slimes, Cyanamid, Dye Intermediates, Charcoal, Graphite, Lithopone, Nickel Carbonate, Gun Cotton, Oils, Sodium Arsenate, Saccharate of Lime, Salt, Starch, Sulphonate, White Lead, Zinc Oxide, Clays, Paper Pulp, etc.

**Features—**

1. Automatic and continuous.
2. No labor required.
3. High capacity.
4. Cleanliness of operation.
5. Long life of filter cloth.
6. Separation of wash water from filtrate.
7. Excellent wash.
8. Dry cake.
9. Maximum all around efficiency.

*Continued on Next Page*

### ZENITH CONTINUOUS ROTARY HOPPER DEWATERER

This type consists of a series of false bottomed hoppers arranged radially about a central shaft. Each compartment is connected by a separate pipe line to a specially designed valve hub which rotates against a stationary valve cap. This valve cap is cored into recesses and is connected to suction and pressure lines, suction for filtering and washing, and pressure for discharging.

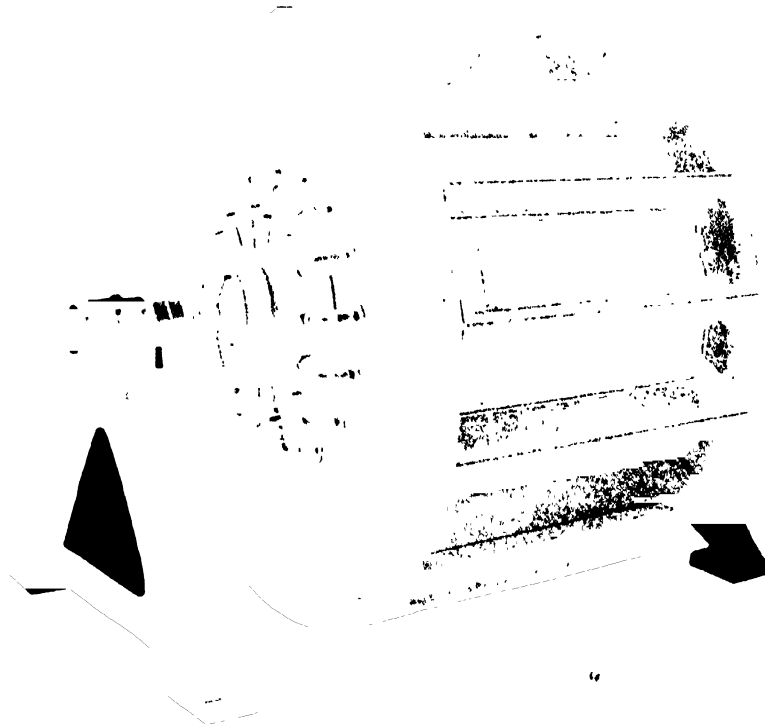
The Zenith Rotary Hopper Dewaterer replaces expensive *power* consuming centrifugals or *cumbersome antiquated* settling tanks by modern inexpensive machinery, operating continuously and automatically.

**Operation** The slurry to be handled is fed to the hoppers, from an overhead chute, as they pass beneath and about 30° before they reach the zenith. Suction which is automatically applied at the zenith is continued to just below the horizontal, where it is automatically cut off and the hoppers discharged by gravity or air or steam pressure. Thus as the hoppers revolve they dewater, wash, dry and discharge the solids continuously and automatically at a very low cost of operation.

**Adaptation** This machine is for the filtering or dewatering of coarse or granular particles from a liquid where the separation of solids from liquid is rapid, as in the drawing off of mother liquor from crystals, where the cake formed would be too heavy to be picked up by the rotary filter and such materials as magnetic concentrates, salt, slate, borax shale, sand, copperas, etc.

#### Features

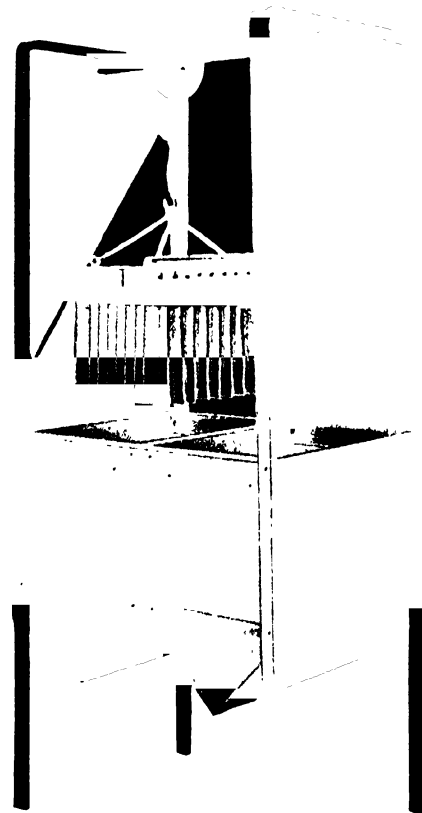
1. Continuous and automatic operation.
2. No manual labor required.
3. Very high tonnages per unit.
4. Minimum cost per ton of cake.
5. Excellent wash with small amount of wash water.
6. Separation of wash water from filtrate.
7. Will handle solids of high specific gravity.
8. Items of repair and renewal are reduced to a minimum.



(Patented)  
**ZENITH ROTARY HOPPER DEWATERER**  
(IRON CONSTRUCTION)

### SERVICE

We maintain a laboratory for the special purpose of testing samples and solving difficult filtration problems.



(Patented)  
**LABORATORY UNIT (Leaf Type)**

The wide experience of our chemists and engineers in industrial and chemical filtration is at your disposal. Whatever your problems their experience and assistance will be of great value to you.

No matter how many installations we have made upon a particular material the varying conditions and methods of production make it always advisable to test samples before making recommendations.

A five gallon sample is sufficient for testing purposes. All samples should be forwarded to our laboratory, 22 East 16th Street, New York, N. Y., accompanied by the information called for on our data sheet.

All experiments and tests are made without charge.

### PATENTS

The Industrial Filtration Corporation, through its sole agency for the owners of the exclusive rights under the well known Moore filter patents, is in a position to grant exclusive license for industrial filtration in connection with filtration apparatus sold by it for industrial work. No additional charge is made by the Industrial Filtration Corporation for this protection.

# INTERNATIONAL COOPERAGE COMPANY, INC.

"International" Barrels and Kegs Made With Tongued and Grooved Staves  
 NIAGARA FALLS, N. Y.

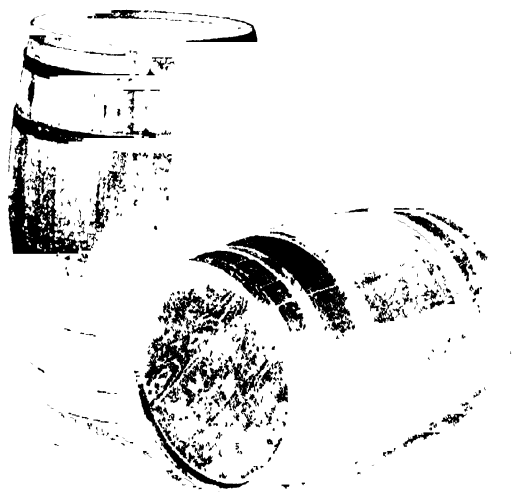
## PRODUCTS

**Wooden Barrels and Kegs for all Dry Materials.**  
**Cooperage Stock and Tools for all Slack Barrels.**

## "INTERNATIONAL" BARRELS AND KEGS

We specialize in the manufacture of high grade barrels and kegs which are light and tight and yet made heavy enough to safely carry ordinary weights in both export and domestic transportation. We make them in numerous sizes and in three classes for light and moderately heavy materials with a third or intermediate type for those who want a special barrel or attractive cleanliness, and style to meet some special requirement, or those who want a standard and exclusive package. These barrels are not made for liquids, but will safely hold heavy pastes, greases, plastic cements, and other similar materials where tightness is essential, but where thickness of materials is not necessary for liquids.

There are many manufacturers whose product is valuable and who have a special pride in delivering to customers in first class condition and quantity, that which their production and sales departments have struggled so hard to manufacture and sell. Many of these have had serious and disturbing losses as a result of poor packages—claims to railroads, extra clerical work in traffic departments, extra correspondence, telephoning, and frequently special trips by a sales department representative to see and pacify a disappointed customer—all these and the frequent loss of labor and money can be avoided by using International Barrels and Kegs with tongued and grooved staves.



INTERNATIONAL TONGUED AND GROOVED BARRELS

## SIZES

We manufacture all sizes to meet every reasonable need from a small keg holding about five gallons up to large barrels holding about seventy gallons. We also have in various sizes, styles and arrangement of hoops, staves or heading, an assortment of forty-five packages. From this wide variety you can find your particular size.

## SERVICE

We operate several branch plants making a variety of sizes to meet the particular requirement of a certain trade. These branch shops are frequently on the premises of manufacturers, who thus have a cooperage department supplying the exact need in quantity and quality without the investment or bother. Where there is a steady use for barrels or kegs, and a little space in the plant can be set aside for cooperage, let us talk over with you this economical and dependable cooperage arrangement. You will profit by it.

These branch shops permit us to give unequalled service to many localities not otherwise served by nearby cooperages. We also carry standard sizes of cooperage stock at such shops from which we can ship on quick notice to nearby points. It is certain that we have a branch shop in your vicinity.

## QUALITY

We aim to give the best grade of stock and workmanship in our various types and grades. From our tongued and grooved barrel to the cheapest class of barrel each of its class will represent a standard in quality that is unequalled. Our types vary from small kegs suitable for dyes and other valuable pastes or powders to largest sizes of pottery casks.

## SAMPLES AND PRICES

Let us discuss your packing problems. Let us show you what poor barrels mean in retarding your development, handicapping your sales department, burdening your traffic department, thus adding to overhead. Losses paid by railroads are charged back to you in freight rates. You simply do the bookkeeping when you credit the railroad with payment of a claim. You pay the price. We will send you samples of what we believe will help you. Prices will always be right under all conditions.

# INGERSOLL-RAND COMPANY

Manufacturers of  
Compressed Air, Vacuum and Pumping Machinery  
GENERAL OFFICES: 11 BROADWAY, NEW YORK, N. Y.

## BRANCHES THE WORLD OVER SALE'S OFFICES IN UNITED STATES

Atlanta, Ga.  
Birmingham, Ala.  
Boston, Mass.  
Butte, Mont.  
Chicago, Ill.

Cleveland, Ohio  
Dallas, Texas  
Denver, Colo.  
Detroit, Mich.  
Dubuque, Minn.

El Paso, Texas  
Houghton, Mich.  
Joplin, Mo.  
Knoxville, Tenn.  
Los Angeles, Cal.

New Orleans, La.  
New York, N. Y.  
Philadelphia, Pa.  
Pittsburgh, Pa.  
Salt Lake City, Utah

San Francisco, Cal.  
Scranton, Pa.  
Seattle, Wash.  
St. Louis, Mo.  
Washington, D. C.

## SALES OFFICES OUTSIDE THE UNITED STATES

Antofagasta, Chile  
Batavia, Neth. E. Indies  
Bombay, India  
Brussels, Belgium  
Budapest, Hungary  
Buenos Aires, Argentine  
Calcutta, India  
Christiania, Norway  
Cobalt, Ont.

Copenhagen, Denmark  
Düsseldorf, Ger.  
Glasgow, Scotland  
Havana, Cuba  
Honolulu, T. H.  
Iquique, Chile  
Johannesburg, S. A.  
Juneau, Alaska  
Kalgoorlie, W. Aust.  
Kobe, Japan

La Paz, Bolivia  
Lima, Peru  
London, England  
Madrid, Spain  
Manchester, England  
Melbourne, Aust.  
Mexico City, D. F.  
Milan, Italy  
Montreal, Quebec

Nelson, B. C.  
Paris, France  
Rangoon, Burma  
Rio de Janeiro, Brazil  
Rotterdam, Holland  
Santiago, Chile  
Secunder, Africa  
Semarang, Neth. E. Indies  
Sherbrooke, Quebec  
Sourabaya, Neth. E. Indies

Stockholm, Sweden  
Sydney, N. S. W.  
Tokyo, Japan  
Toronto, Ont.  
Valparaiso, Chile  
Vancouver, B. C.  
Vienna, Austria  
Winnipeg, Man.

To insure correspondence against avoidable delay, all communications should be addressed to the place nearest the writer.

## PRODUCTS

Air Compressors  
Vacuum Pumps  
Air Lift Pumping Systems  
Condensing Plants, Ingersoll-Rand Barometric Type  
for Steam and other Vapors, Ingersoll-Rand Low  
Level Multi-Jet and Surface Types  
Direct Acting and Centrifugal Pumps  
Rock Drills  
Pneumatic Tools  
Air Hoists  
Turbo Blowers and Turbo Compressors  
Oil and Steam Engines

## INGERSOLL-RAND AIR COMPRESSORS

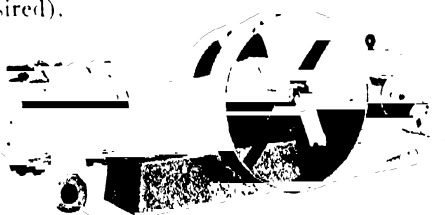
In whatever quantity and at whatever pressure you require compressed air, there is a suitable Ingersoll-Rand Compressor.

The compressors described in detail in these pages are those most likely to be of interest in a majority of instances to the chemical industries. Numerous other types of compressor are included in the Ingersoll-Rand line and if you will let us know the details of your requirements we can usually suggest a suitable piece of equipment from our standard line.

In choosing an Ingersoll-Rand Compressor you have the assurance that your machine is up to the minute in design, highly efficient and truly economical, not only of power, but also of the equally important items of attendance and upkeep.

## INGERSOLL-RAND CLASS "ER-1" COMPRESSOR

These are horizontal, double-acting, single-stage machines and represent a unit having automatic lubrication and regulation requiring a minimum of care and attention. They may be driven from line shaft, individual motor or gas engine (with short belt drive if desired).



INGERSOLL-RAND CLASS "ER" COMPRESSOR

Briefly stated, the features that recommend this type to the users are:

**Automatic Splash Lubrication**, by means of which all driving parts are copiously and automatically oiled. Sight feed lubrication for air cylinders.

**Liberal Bearing Surfaces** have been provided to insure smooth running.

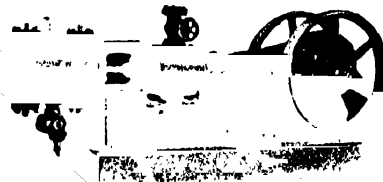
**Complete and Liberal Water Jacketing** of air cylinders. **Enclosed Construction with Removable Covers** makes for cleanliness along with accessibility.

**Heavy One-Piece Main Frame** lends rigidity to the entire machine.

**Foundation is the Simplest Imaginable**, making the machine easy to install.

**Ingersoll-Rand Plate Inlet and Discharge Valves** provide for the admission and discharge of the maximum air volume. They are silent in operation and long lived. Scarcely ever require attention and are entirely independent of any driving mechanism.

Capacities 28 to 955 cu. ft. per minute, pressures 10 to 110 lbs. per square inch. Bulletin No. 3330.



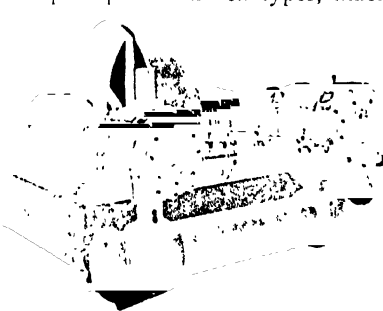
INGERSOLL-RAND CLASS "FR-1" COMPRESSOR

For corresponding steam driven units the Company offers its Class "FR," which is identical with the Class "ER" described above, it being direct connected to steam engine having balanced piston valve with automatic cut-off fly wheel control governor, making it possible to operate with high pressure and superheated steam, as well as with moderate pressures and saturated steam.

These are offered in capacities between 67 and 1086 cu. ft. per minute at pressures from 10 to 125 lbs. per sq. in. Bulletin No. 3131.

## "IMPERIAL" TYPE XB AIR COMPRESSORS

Duplex power driven types, machines of single or



"IMPERIAL" TYPE XB DUPLEX POWER DRIVEN COMPRESSOR

two-stage construction. May be run from any available motive power or can be furnished at extra cost with short belted electric motor drive—including endless belt, floating idler attachment and foundation bolts.

Several exclusive features characterize these machines, among which the following may be emphasized:

**Automatic Splash Lubrication** which supplies the right amount of oil to all parts at all speeds.

**The Main Bearings** are an integral part of the frame.

*Continued on Next Page*

Complete and Liberal Water Jacketing insures efficient cooling.

Enclosed Construction, having entire running gear, with removable covers making unit readily accessible.

Centrally Hung Driving Wheel evenly distributing weight of machine over entire foundation.

Heavy and Substantial Main Frame making the machine a solid and self-contained unit.

Air Cylinders Bolted to Frame are in no way dependent upon the foundation for correct alignment.

Capacities 198 to 3508 cu. ft. per minute, pressures from 15 to 100 lbs. per square inch. Bulletin No. 3312



"IMPERIAL" TYPE XPV COMPRESSOR

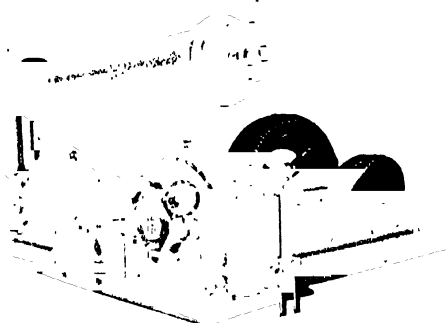
### "IMPERIAL" TYPE XPV COMPRESSOR

The "Imperial" Type XPV Compressors are of duplex, single or two-stage construction and are equipped with balanced piston steam valves suitable for high steam pressures and superheat as well as for saturated steam. These compressors are furnished with automatic cut-off governor.

Built in capacities ranging from 608 to 5155 cu. ft. per minute, pressures from 15 to 110 lbs. per sq. in. Bulletin 3033

### CLASS "PRE" AIR COMPRESSORS

Ingersoll-Rand Class "PRE" Compressors are duplex, single or two-stage units having electric motor direct-connected to compressor shaft. Regularly fitted with patented automatic 5-step clearance control.



INGERSOLL-RAND CLASS "PRE" COMPRESSORS

Standard duplex construction lends itself to a most advantageous design, with the motor placed between the bearings, the rotor being securely pressed and keyed on the compressor shaft. The illustration above gives a clear idea as to the general, compact and massive construction adopted.

Other "PRE" features includes: automatic lubrication, dust proof enclosed construction, Ingersoll-Rand plate inlet and discharge valves and intercooler.

Capacities from 627 to 7817 cu. ft. per minute, pressure 15 to 110 lbs. per square inch. Bulletin No. 3126

### THE AIR LIFT SYSTEM OF PUMPING

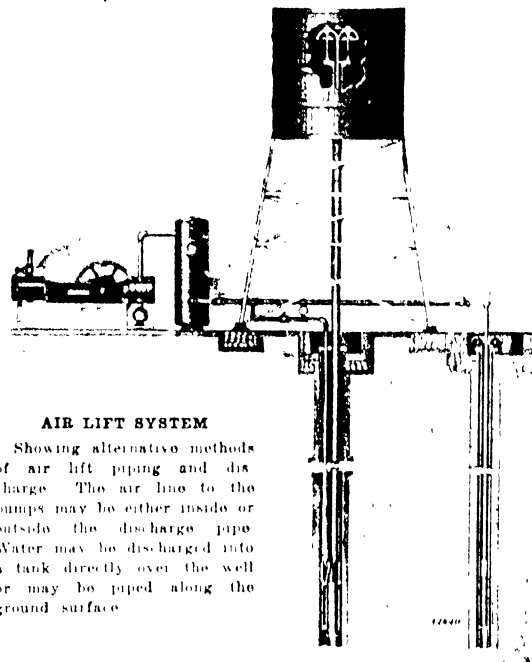
The Air Lift System of elevating liquids has reached a stage of engineering development that warrants the attention of operating men who are contemplating installing pumping equipment. It has

Utility                      Simplicity and Reliability

Unlimited capacity      Low Maintenance Cost

Owing to the high state of efficiency now obtainable by means of the Air Lift, the scope of its application has been widely extended.

It is recognized as a superior method of elevating water for cooling and condensing, acids and alkalis for chemical processes, as well as vegetable and mineral oils, solvents, dye liquors, trade wastes, and a number of other liquids used in the industries.



AIR LIFT SYSTEM

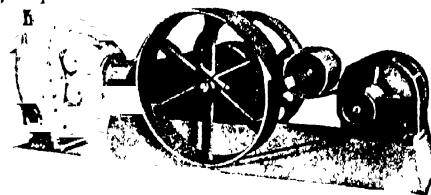
Showing alternative methods of air lift piping and discharge. The air line to the pumps may be either inside or outside the discharge pipe. Water may be discharged into a tank directly over the well or may be piped along the ground surface.

The strong features of the Air Lift are that there are no moving parts in the well or source of fluid supply. All machinery needed is contained in the air compressor located at any point where the expense of attendance is least, or where it is most convenient to place it. Flexibility in the location of the power plant is one of the most striking features of the Air Lift installation, since the loss in transmitting air is negligible, providing the pipe lines are properly designed and laid.

Our engineers are specialists in laying out the proper Air Lift System for the work required, and they are at your service.

### INGERSOLL-RAND VACUUM PUMPS

Ingersoll-Rand Vacuum Pumps are suitable for every requirement of the chemical industries where a reliable and efficient dry vacuum pump is needed. They combine large capacity with minimum space requirements, and are largely automatic in their action, reducing supervision to a minimum.



INGERSOLL-RAND STRAIGHT-LINE BELT DRIVEN VACUUM PUMP

Various types can be recommended adapted to operation of condensers, vacuum dryers, vacuum stills and kettles, impregnating equipment, paper mill machinery, laboratory vacuum installations, etc.

These pumps are all capable of maintaining a high vacuum and can be arranged for discharge pressures of several pounds.

*Continued on Next Page*

Ingersoll-Rand straight line power and steam driven vacuum pumps are single-stage, double-acting having vacuum cylinders fitted with Ingersoll-Rand plate valves. The power driven units can be furnished with or without short belt drive and electric motor. The steam driven unit is furnished with piston steam valve which permits the use of superheat and high steam pressure as well as saturated steam, and also with adjustable speed throttling governor.

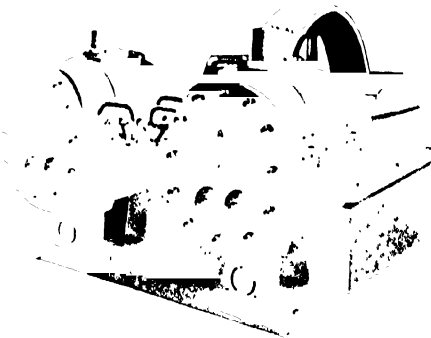
Built in capacities ranging from 292 to 2295 cu. ft. per minute. Bulletin No. 3137.



**"IMPERIAL" DUPLEX STEAM DRIVEN VACUUM PUMP**

"Imperial" duplex belt and steam driven vacuum pumps are single-stage and double-acting, but for special work where unusually high vacuum is required the cylinders may be connected in series. Belt driven units can be furnished for short belt drive to electric motor. Steam driven units have "D" steam valve with fixed cut-off and the larger sizes, Meyer valve gear or with "Imperial" balanced piston steam valves of the telescopic type. The latter unit is especially adopted for high steam pressures and high superheat as well as for ordinary steam conditions.

Built in capacities ranging from 1048 to 5571 cu. ft. per minute. Bulletin No. 3138.



**"IMPERIAL" DUPLEX BELT DRIVEN VACUUM PUMPS**

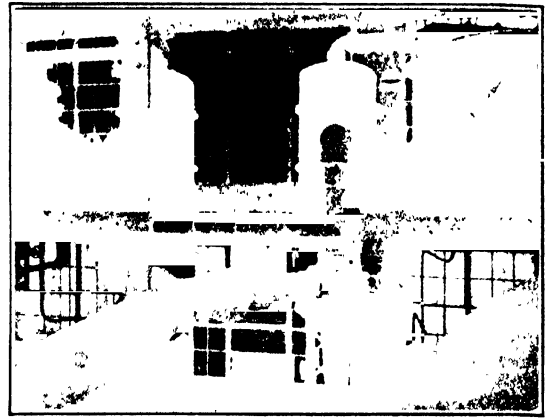
### INGERSOLL-RAND CONDENSING PLANTS

A condensing plant consists of a suitable condenser, together with the necessary accessories.

The Ingersoll-Rand Company builds a variety of condensers, vacuum pumps and water pumps, and can supply a suitable condensing plant to meet any set of service conditions.

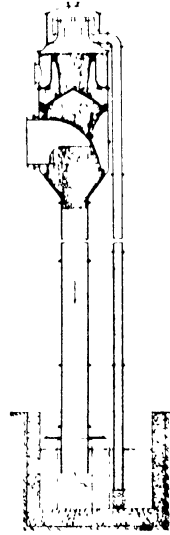
Ingersoll-Rand condensing plants are today operating successfully in hundreds of installations in connection with steam engines, turbines, evaporators, vacuum pans, stills, dryers, continuous filters and other machinery.

**Ingersoll-Rand Barometric Type Condensing Plants**—This type of plant consists of a barometric condenser (patented) of simple and efficient design together with a suitable dry vacuum pump, and a Cameron Centrifugal Circulating Water Pump, together with the necessary connections.



**TWO NO. 10 I. R. BAROMETRIC CONDENSERS**

Serving turbines at a large Pennsylvania plant. 24" vacuum is maintained with 70 deg. cooling water and each condenser handles 15,000 lbs. of steam per hour.



**SECTIONAL VIEW  
OF AN INGERSOLL-  
RAND BAROMETRIC  
CONDENSER**

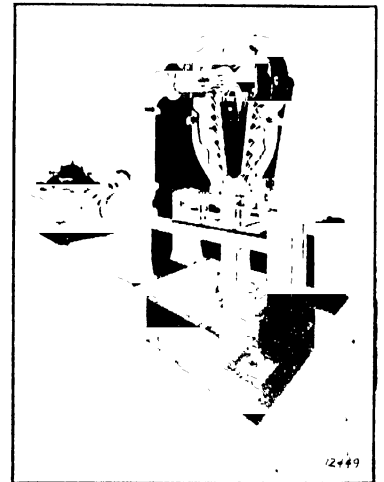
This type of installation operates on the "dry system," i.e., the air and water are removed separately. It is of the counter-current type, insuring the discharge of the air and vapor at the lowest practical temperature. The cooling water is removed automatically, obviating pump troubles and the use of vacuum breakers. The vacuum and water pumps are independently operated by prime-movers separate from the main unit (when the condenser is used in connection with engines and turbines). These prime-movers may be steam, belt drive or electric motors. Bulletin No. 9224.

**Ingersoll-Rand Low Level Multi-Jet Condensing Plants**—This type is suitable for many installations in which compactness and simplicity are major considerations.

Unlike many jet condensers it requires no water-removal pump at

the base of the condenser nor is an air pump needed under any condition. The water is injected into the condenser at a pressure of about 9 lbs. per sq. in.

The Ingersoll-Rand Low Level Multi-Jet Condenser has a number of converging jets of water which condense the steam and also eject the air and non-condensable vapors. The steam is admitted through a top inlet or side inlet nozzle as desired to suit local conditions. Bulletin No. 9032.



**COMPLETE MULTI-JET CONDENSING PLANT**



# CAMERON DIRECT ACTING AND CENTRIFUGAL PUMPS

The illustration shows the pump we supply for water circulation with condensing engines. There is a Cameron Pump for fluid handling of all sizes. For complete range of sizes and types see Bulletin 7252, 7304, 7350, 7351.



CAMERON DOUBLE SUCTION VOLUTE CENTRIFUGAL PUMP

## HORIZONTAL AND VERTICAL OIL ENGINES

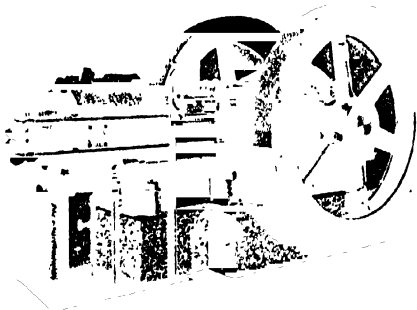
The Price "PO" single cylinder horizontal and "PR" multi-cylinder vertical oil engines will furnish satisfactory power for all general purposes and represent the highest developments of American oil engine manufacture.



They operate on four-stroke cycle with mechanical self-injection of fuel without the aid of compressed air. Ignition is solely by temperature of compression and no hot bulbs or plates are used, the cylinder and heads being entirely water jacketed.

The engines will operate on any clean, commercial crude oil, that is sufficiently fluid to flow freely at engine room temperature. Price oil engines have the economy of the Diesel engine and the simplicity of the steam engine.

Horizontal Stationary Type "PO"—45 and 90 H. P.  
Vertical Stationary Type "PR"—105-1000 H. P.  
Full information on request.



INGERSOLL-RAND (PRICE TYPE) "PO" HORIZONTAL OIL ENGINE

## HAND HAMMER ROCK DRILLS

Ingersoll-Rand "Jackhammers" are one-man, compressed air or steam operated. They are light yet steady and rapid hand-held rock drills and extremely useful for drilling rock, concrete, masonry, etc., when digging ditches, putting in foundation bolt holes and similar work. Bulletin No. 4046.

For such work as tearing up concrete flooring, breaking down slag or ash piles, and similar demolition work the Ingersoll-Rand Paving Breakers will prove time and money savers. These are one-man machines and operated by compressed air. Bulletin No. 4051.

## PNEUMATIC TOOLS

"Little David" chipping, scaling and calking hammers, core breakers, riveters, holders-on and jam riveters, drills, including close quarter types, wood boring machines, flue rollers and portable grinders, hoists and

stationary motors, sand rammers and calking machines, drift bolt drivers. Tools to suit every requirement.

They typify superiority in design, workmanship and material and are distinguished by a large capacity for work with small air consumption. Bulletin No. 8000.

## PNEUMATIC HOISTS

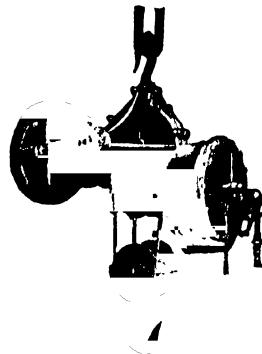


LITTLE TUGGER HOIST

The "Little Tugger" Hoist is a labor and time saver whose value is unlimited, as it may be used for many lifting, handling and hauling jobs. They are built in two sizes and six types which can be supplied for operating by either air or steam. These sizes differ only in size of drum and base, which change accommodates the use of

TYPE	No. 1 H & 1 HS	No. 11 H & 11 HS
Weight, less Cable	285 lbs.	158 lbs.
Width	21 1/4 in.	11 1/4 in.
Length	16 1/2 in.	21 1/2 in.
Height	20 1/2 in.	24 in.
Size of Drum, Rope Space, dia.	6 in.	7 in.
Size of Drum, between Flanges	7 in.	17 in.
Length	4 in.	5 in.
Depth of Flanges	1 1/4 in.	3 in.
Rope Capacity	700 ft.	300 ft.
Rope Speed	1/2 in. — 150 ft.	
Lifting Capacity at 80 lbs. Pres. Sure	8 1/2 ft. per min. 1000 lbs.	8 1/2 ft. per min. 600 lbs.
Horse Power	2 1/2	2 1/2
Hose Recommended	3/4 in.	3/4 in.

manilla rope. They are simple to mount and weigh from 125 to 500 lbs. less than other hoists having similar capacity and are self-contained, which affords their being set up and taken down quickly. The base of the hoist is arranged so it can be bolted to a timber or other convenient place. Bulletin No. 4333.



NO. 7 "LITTLE DAVID" AIR MOTOR HOIST

## "LITTLE DAVID" MOTOR HOISTS

Size No.	Capacity Lbs.	Feet Lift per Min. 80 lbs. Pressure	Maximum Lift Feet	Size and Length Wire Rope	Net Weight Lbs.
1	1000	32	20	1 1/2"x41' 0"	270
2	2000	16	20	1 1/2"x41' 0"	280
4	4000	8	20	1 1/2"x41' 10"	395
7	7000	8	20	1 1/2"x90' 6"	785
10	10000	7	20	1 1/2"x90' 6"	785

## THE "CLINKERBREAKER"

The "Clinkerbreaker" is a compressed air operated tool for rapidly, efficiently, and economically breaking down for removal hard clinkers such as are formed in gas generators.

This machine delivers many hundreds of forceful blows per minute to the steel which will break down the hardest clinker so that the fires may be run to obtain maximum gas output. The removal of the clinker can be absolutely controlled. This prevents the fires from dropping prematurely, thus saving fuel. Full information on request.

# INTERNATIONAL ENGINEERING WORKS, Inc.

INCORPORATED UNDER THE LAWS OF MASSACHUSETTS

## Steel Plate Construction and Steam Boilers

MAIN OFFICE AND WORKS

FRAMINGHAM, MASS.

BOSTON, Board of Trade Building, Rooms 1029-1030

### PRODUCTS

#### All forms of Steel Plate Construction required for:

Paper and Textile Mills  
Chemical and Rubber Plants  
Slaughtering and Rendering Establishments  
Cold Storage and Refrigeration Plants

#### Open and Closed Tanks of all descriptions including:

Digesters and Kiers  
Vulcanizers  
Rendering Tanks  
Mixing Tanks  
Jacketed Kettles and Jacketed Tanks

#### All types of Externally and Internally Fired Fire-tube Boilers for Power and Heating Purposes including:

Horizontal Return Tubular and Vertical  
Locomotive and Scotch Marine

#### Guyed and Self Supporting Steel Stacks

#### Smoke Flues and Breechings

#### Penstocks and Flumes

#### Horizontal Water Tube Boilers

### PLANT AND EQUIPMENT

The Plant of this company comprises buildings of modern construction designed expressly for the manufacture of steam boilers and the fabrication of all forms of steel plate construction, fully equipped with the requisite tools and labor saving devices necessary for the efficient execution of the work.

The works include a pattern shop, machine shop, steel plate and light iron shops, and a forge shop. In addition to the usual tools required in these departments the equipment of the plant includes electric welding apparatus and a large hydraulic press making it possible to execute the most intricate forms of construction in an entirely satisfactory manner.

### SERVICE

The knowledge acquired in dealing with numerous problems involving steel plate construction and extending over a period of more than 60 years places this company in an exceptional position to serve its patrons intelligently.

A competent staff of engineers, with practical knowledge of available materials, will prepare working drawings for apparatus to meet special conditions, thereby effecting a considerable saving in the cost of the equipment as well as the time required to complete the installation.

An efficient cost system forms a basis for reliable estimates, and expert supervision of the work in all its branches insures the highest quality of workmanship and the completion of all contracts within the time specified.

### SPECIAL APPARATUS

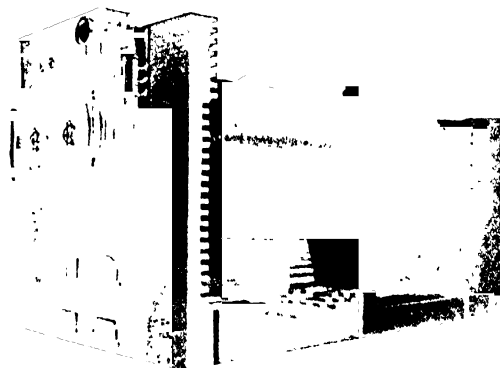
The illustrations on the opposite page represent only a few examples of equipment used in the chemi-

cal industries which this company is prepared to furnish.

The facilities available at this plant for the construction of equipment requiring special castings or an unusual amount of machine work are unexcelled, and insure the satisfactory handling of such work.

### STEAM BOILERS

This company manufactures all types of fire-tube boilers to comply with the code established by the A S M E or in accordance with whatever local regulations may govern the installation of steam boilers or other pressure vessels.



HORIZONTAL RETURN TUBULAR BOILER

All boilers are carefully inspected and tested before shipment and the purchaser is furnished with the customary insurance against defects in material or workmanship.

A large stock of raw material makes it possible to fill orders for all standard sizes of horizontal return tubular and vertical boilers promptly, many of which are carried in stock for immediate shipment.



BRADY TYPE SCOTCH BOILER

The accompanying illustration shows a type of internally fired boiler developed by this company which has proved most efficient and especially adapted for service where brick set boilers cannot be installed to advantage.

*Continued on Next Page*

**REFRIGERATION PLANTS**

Equipment for both the Absorption and Compression systems of refrigeration has been specialized in. Various types of apparatus have been designed, operators as illustrated, Condensers, Liquor Receivers and Absorbers of varying sizes to meet the demands of systems.



ABSORPTION SYSTEM GENERATORS

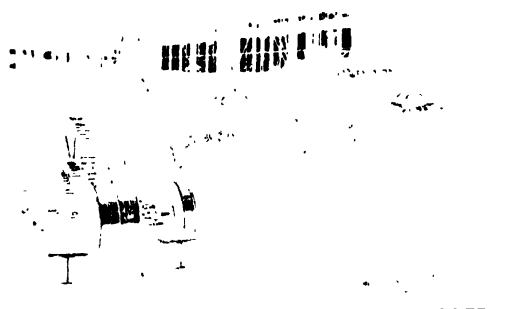
**RUBBER MACHINERY**

Rigid, belt driven rubber churns containing paddles with a pitch that insures an even mixture. These churns are equipped with a patent non-leakable cover to prevent evaporation of the volatile oils.



CARLOAD OF MIXING TANKS

Rubber Vulcanizers with quick opening heads eliminating the usual loss in time in loading and emptying. These Vulcanizers are equipped with car and truck and built either jacketed or plain.

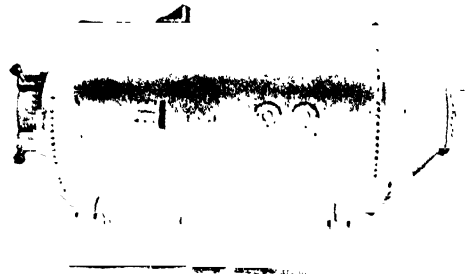


JACKETED RUBBER DEVULCANIZER

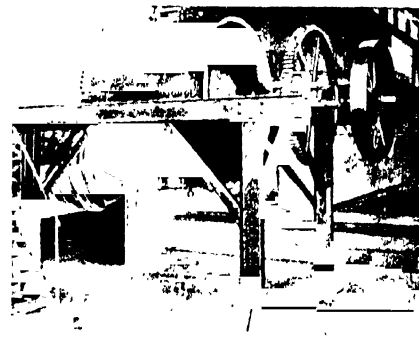
Devulcanizers are built either revolving or stationary. The jacketed revolving Devulcanizer carries steam to the jacket through one of the bearings equipped with a special gland and packing chamber to prevent leakage.

**RENDERING PLANTS**

Conical bottom tanks where cooking by steam is required are made which are especially adapted to Rendering and Soap Manufacturing Plants. These tanks are equipped with quick opening covers. Designed for varying pressures to meet different requirements.



RENDERING TANK



JACKETED MIXING TANK

**CHEMICAL WORK**

Special churns and mixers for chemical work. Vats, tanks, churns and mixers. Illustration shows a stationary tank set on a framework with the paddle unit driven through the train of gears.



MIXING TANK

# INTERNATIONAL EQUIPMENT COMPANY

352 Western Avenue, Brighton

BOSTON, MASS.



Catalog 1915

## PRODUCTS

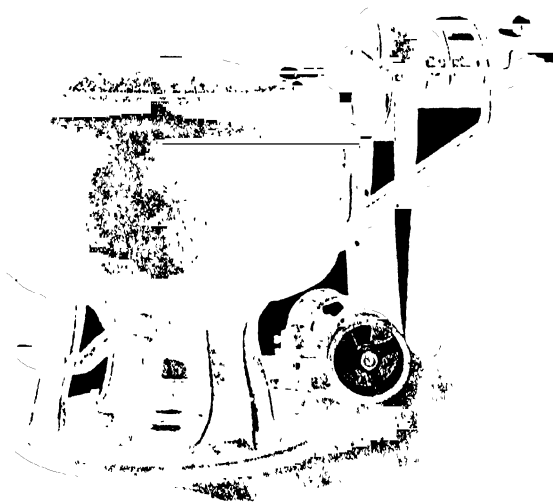
Laboratory and Commercial Centrifugals, Bottle Shakers, Kjeldahl Stills, Fabric Washing Machines.

### CENTRIFUGALS, COMMERCIAL

For belt-drive from power shafting, or with electric motor attached. Baskets, being under driven, have full open top. Usual construction, steel or tinned copper with reinforcing steel bands. Draining chambers of cast iron. When necessary, draining chambers may be lined with sheet lead or block tin. Baskets may be lined with sheet lead or hard-rubber covered.

Regular sizes, 15, 20, 26, 30 inches diameter of perforated basket.

Friction Pulley supplied with sizes above 20" diameter. Foot brake attached to all sizes.

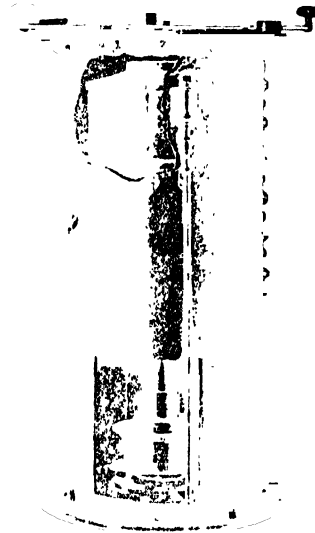


COMMERCIAL CENTRIFUGAL

The baskets are self-balancing, the shafts being free to rock on a ball seat at the center of the driving pulley, but controlled and confined against excessive freedom by the Crawford Rubber Stand, a practical device for steadying the Centrifugal shaft by a sleeve bearing attached to a rubber compression chamber.

The moving parts are machined and balanced to run true and without vibration.

Correspondence solicited.



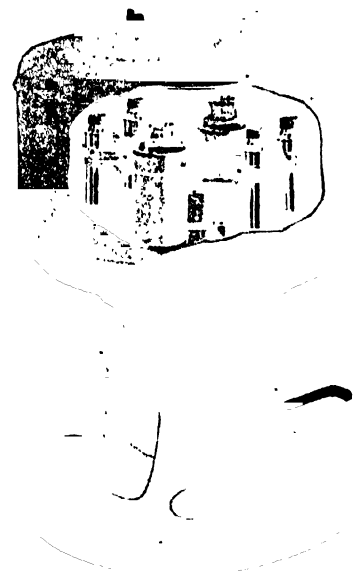
HIGH SPEED CENTRIFUGAL

### CENTRIFUGALS, SPECIAL, HIGH SPEED

Baskets 5", 8", 11", 14" diameter.

For Research and Experimental solution of Production Problems.

In asking for details of our machines, give us information regarding the nature of your problems.



ANALYTICAL CENTRIFUGAL

### CENTRIFUGALS, ANALYTICAL

In several sizes, with variety of equipment. Tubes varying from 15 c.c. to 250 c.c. capacity. Wide range of speed variation. Electric motors direct connected on Centrifuge shaft.

# INTERNATIONAL OXYGEN COMPANY

NEWARK, N. J.

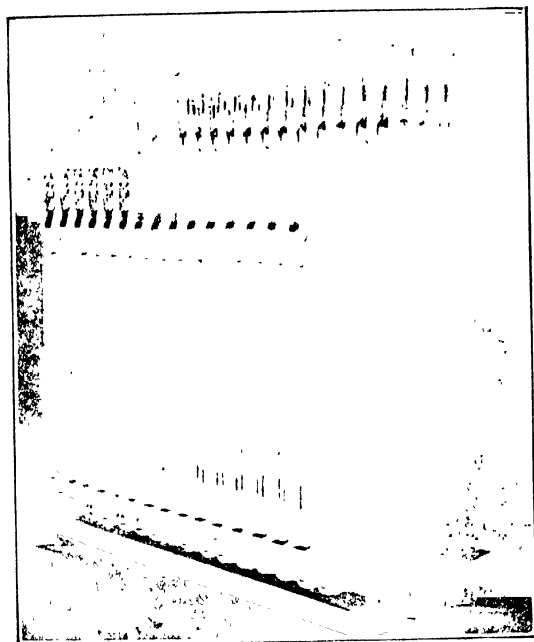
Plants and Offices: New York, N. Y.; College Point, N. Y.; Pittsburgh, Pa.; Verona, Pa.; Toledo, Ohio; Chicago, Ill.; London and Paris

## PRODUCTS

Generators for Oxygen and Hydrogen; Pressure Regulating and Reducing Valves for high pressure gases; Gas Testing Apparatus and Cylinders; Distilling and Hydraulic Testing Apparatus; Pure Oxygen, Hydrogen and Nitrogen gases in cylinders; Anhydrous Ammonia; Cylinder Stud Valves.

## SERVICE

The organization takes in the requirements of the entire field of oxygen and hydrogen users. It manufactures unit oxygen and hydrogen generators for any quantity of gas needed, designs and constructs complete Oxygen, Hydrogen and Synthetic Ammonia Plants.



BANK OF 16 I. O. C. TYPE 4-1000 OXY-HYDROGEN GENERATORS

### I. O. C. TYPE 4-1000 OXY-HYDROGEN GENERATOR

These generators of the unit or single cell type have set a new standard of economy in gas production.

Each generator is complete in itself, making pure oxygen and pure hydrogen at a rate determined by the amperage of the electric current supplied.

Each unit requires floor space of 4' x 42" or about the equivalent of a square foot and with necessary pipe connections needs head-room of about 7 feet. The normal capacity of this generator per unit of floor space is 200% greater than any other apparatus on the market.

Practically no organic material enters into its construction. There are no moving parts, therefore no wear. The materials used are time proof and immune to chemical action or deterioration.

## ELECTRICAL EFFICIENCY

At normal current of 1000 amperes each cell, with an electrolyte of caustic potash solution, requires 2.1 volts and has a guaranteed capacity of 8 cu. ft. of oxygen and 16 cu. ft. of hydrogen per clock hour. The electrical efficiency is 3.75 cu. ft. of oxygen and 7.5 cu. ft. of hydrogen per kilowatt hour.

Below 1000 amperes a slightly higher electrical efficiency is obtained but the gas output per cell diminishes. Above 1000 amperes the electrical efficiency diminishes slightly while the output per cell increases.

When the demand falls below normal, current can be saved by running the plant on a lower amperage, thus securing the smaller gas output needed at a higher electrical efficiency. As gas requirements increase, a higher amperage can be used and a larger output secured.

It is practical to operate at a range varying from less than 200 amperes to upwards of 1200 amperes—or at a ratio of more than 1 to 6.

### CAPACITIES—I. O. C. TYPE 4-1000 UNIT GENERATORS

Number of Cells	Capacity in Cu. Ft. per 24 Hours At 1000 Amperes	
	Oxygen	Hydrogen
25	4800	9600
50	9600	19200
75	14400	28800
100	19200	38400
150	28800	57600

## PURITY OF GASES

I. O. C. Type 4-1000 Generators are guaranteed to produce gases of a minimum purity of 99.5% for oxygen and 99.75% for hydrogen. Experience, however, shows oxygen averaging 99.7% pure and hydrogen over 99.9% pure.

## I. O. C. ENGINEERING SERVICE

The Company designs, installs, and puts into operation oxy-hydrogen plants complete in every detail—not alone I. O. C. generating apparatus but also such accessories as motor-generators, switchboards and control apparatus, compressors, gas holders, piping systems, and apparatus for utilizing the gases.

Or the Company will, in connection with the purchase of its own apparatus, prepare plans for the complete installation and furnish specifications covering all accessories—with a view to safeguarding the purchaser's interests at every point.

# IRVING IRON WORKS COMPANY

**IRVING SUBWAY**  
TRADE MARK  
THE FIREPROOF VENTILATING FLOORING

Dutchkill Creek and Third Street  
LONG ISLAND CITY, NEW YORK

Telephone Hunters Point 3342

**IRVING SAFSTEP**  
TRADE MARK  
ABSOLUTELY NON-SLIPPING ALWAYS

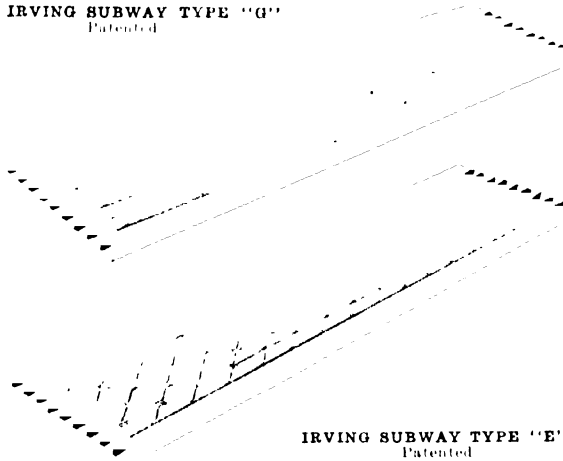
## PRODUCTS

Sole Manufacturers of Irving "Subway," "Sunway," "Reticuline," "Eggcrate," "Honeycomb," and other forms of grating, grating-flooring, and grating-flooring accessories; Irving "Safstep" Stair Steps; Irving Walkways; metal accessories for chemical, dye, power, pumping, and industrial plants.

## TRADE-MARKS

The trade-marks "Subway," "Sunway," "Safstep" and "Reticuline" are registered in the U. S. Patent Office, are the exclusive property of this company, and cannot legally be used in connection with any grating or grating-flooring product made by any other company.

IRVING SUBWAY TYPE "G"  
Patented



IRVING SUBWAY TYPE "E"  
Patented

## CONSTRUCTION

Irving Subway consists of a series of light steel bars placed on edge, between each pair of which a reticuline bar is placed and firmly riveted in position. The finished section is a light but inflexible panel embodying the well-known truss principle of construction, by which a load applied at any point is at once distributed over a wide area. Maximum strength is thus secured with the minimum weight of material. When riveted up, each section of Irving Subway is, in all essentials, a solid unit in which there is, and can be, no looseness, no play, no rattling.

## TYPES

There are two standard types of Irving Subway, differing in appearance and in price, but not in strength or general merit. In Type "G" the crimp of the reticuline bars is elongated, with a spacing of 7 inches between rivets, resulting in a panel with comparatively large openings—"open mesh," to use a common term. In Type "E" the crimp in the reticuline bars is shorter and rivet spacing  $3\frac{1}{2}$  inches—resulting in a panel of smaller openings and "close mesh." The rated load capacity is the same for both Type "G" and "E." Choice between them in any case is to be determined by the factor of size of mesh.

## EXCLUSIVE ADVANTAGES

Briefly summarized, Irving Subway offers the following exclusive advantages over any other form of grating or grating-flooring:

Maximum strength per unit of weight; minimum weight per unit of load and span; uniform distribution of load by truss construction; minimum deflection per unit of load and span, maximum lighting and ventilation area (80% of panel area); absolutely non-slipping surface; cannot become loose and rattly; oil or grease age or wear, does not impair its non-slipping qualities; minimum lodgment for dirt or solid objects; small size of individual openings (mesh) prevents passage of tools, etc.; wheels or rib-hooped barrels can be rolled over it in any direction without going through; its light weight means minimum weight and cost of the supporting structure; safe, comfortable and noiseless to walk or work upon, safe to work under, because nothing large and heavy can fall through it; openings for pipes, columns, etc., can be cut out without seriously impairing the strength of the panel; easily fitted into corners or formed in irregular shapes without impairment of strength; while affording maximum opening for lighting and ventilation, the depth of the bar members obstructs vision except when directly beneath; easily mounted or attached to any type of construction by means of specially devised fasteners—no drilling, no tapping, no bolts or screws needed.



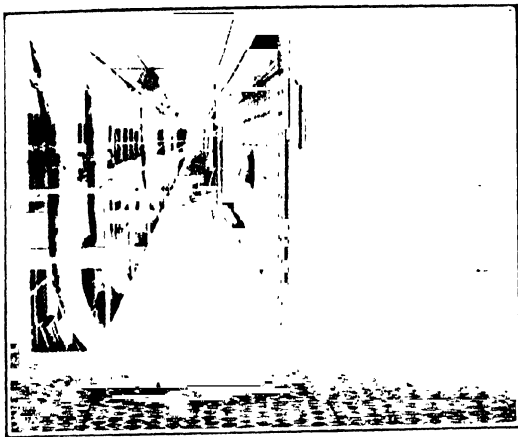
USED AS AN OPEN FLOORING IN CHEMICAL AND INDUSTRIAL PLANTS, IRVING SUBWAY IS EASILY ADAPTABLE TO EVERY REQUIREMENT

## INDUSTRIAL APPLICATIONS

In the industrial world, the question of flooring is intimately identified with that of plant and production efficiency. The preeminent advantages of Irving Sub-

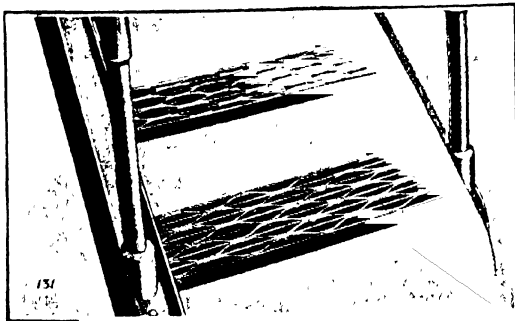
*Continued on Next Page*

have led to its use by engineers in ever-increasing quantities for industrial purposes, some of its applications being as follows: Floors, walkways, and galleries in power plants; boiler room floors in oil-fired plants; pump platforms; covering for turbine pits, pipe trenches, and drainage sumps; floors for mine cages, freight elevators and elevator pent houses, floors or platforms around tanks or vats; charging floors, floors in gas plants and retort houses; a substitute for water-cooled plates affording maximum area; armoring of concrete surfaces; stair and ladder steps, etc. As a removable mat over a floor in laboratories or other places where sand or plaster might fall and be ground under foot and be tracked about, it offers peculiar advantages.



A GALLERY OF IRVING SUBWAY AROUND THE FURNACES IN A CHEMICAL MANUFACTURER'S PLANT

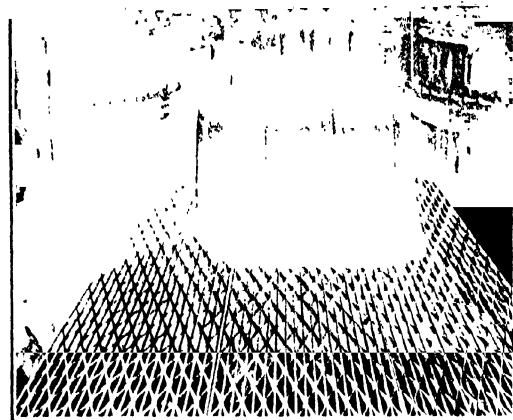
A remarkable fact about Irving Subway is that its adoption in a plant for a specific and probably obvious purpose, has almost invariably been followed by its application in the same plant for many totally different and less obvious purposes. In fact, each month seems to bring forth new applications never thought of before.



A STAIRWAY OF IRVING "SAFSTEPS" IS SAFE AND NON-SLIPPING UNDER ALL CONDITIONS

#### IRVING "SAFSTEP" STAIR STEPS

Originally a special application of Irving Subway, these "Safsteps" have gained such popularity that they



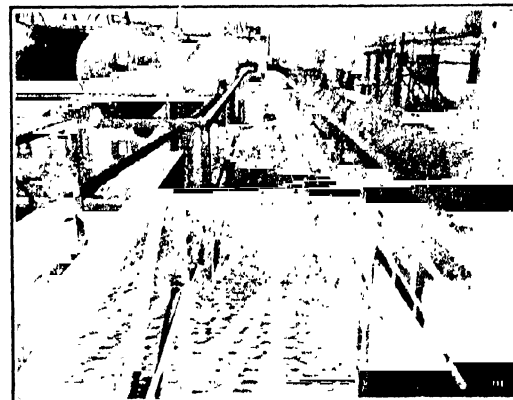
RIB-HOOPED BARRELS ROLL OVER IRVING SUBWAY AS EASILY AS OVER A SMOOTH, SOLID FLOOR

are now a standard product in the Irving line. Each step is a complete unit, with its own carriers, easily installed and more durable than any other step. You never have to "watch your step" on a ladder or stairs with Irving "Safsteps." They are absolutely non-slipping, even with oil or grease upon them. When used out of doors they cannot accumulate snow or ice (as a solid step does)—give a secure footing even in freezing weather. They cannot fill up with dirt, and are clean and sanitary.

They're strong enough for any load that may come upon them—yet so light that they need only the lightest supports. This means a big saving in first cost and in dead weight. Irving "Safsteps" are an effective form of accident insurance in any plant.

#### CATALOG

Catalog No. 3A2, sent on request, gives complete description, load rating, sizes, spans, weights and all other data—together with a list of representative users, reports of tests, and details of various applications.



A CAR LOADING PLATFORM OF IRVING SUBWAY IN A CHEMICAL PLANT—NON-SLIPPING UNDER ALL CONDITIONS

# ISBELL-PORTER COMPANY

Machinists, Founders, and Contracting Engineers

Cable Address  
"ISBELLPORT"

16 BRIDGE ST., NEWARK, N. J.

## PRODUCTS

**Charging and Discharging Machinery and Conveyors for Hot Materials.**

**Woodall-Duckham System of Vertical Retorts.**

**Ring Furnaces; Governors and Compensators; Washers, Extractors and Scrubbers; Coolers; Purifiers; Unger Ammonia Concentrators, Aqua and Sulphate Plants; Gas Valves; Special Castings, Fittings, etc.**

## WOODALL-DUCKHAM SYSTEM OF VERTICAL RETORTS

These retorts are adapted for the production from soft coal of a mixture of coal and water gas of about 450 B.T.U.'s which is free from dust and tar. This gas can be used in all industrial furnaces without preheating air for combustion. These retorts are also used extensively for calcining or "shrinking" petroleum coke in the manufacture of carbon electrodes and are equally applicable to the calcination or reduction of many other materials where temperatures of not over 1350° C. are required.

Fully described in bulletin "G."

## RING FURNACES

These furnaces are especially adapted for the baking of fragile materials requiring gradual heating and cooling and a baking heat of not over 1100° C.

## GOVERNORS AND COMPENSATORS

The Isbell Exhauster Governor regulates the speed of the exhauster engine by the make or pressure of the gas, preserving under all circumstances perfect uniformity of pressure on the retorts. It consists of a balanced piston steam valve connected by means of a lever with the holder or float which rises and falls with the varying pressure of the gas admitted to it through a pipe leading from the inlet side of the exhauster.

We also build compensators for use in connection with exhausters which are operated by motors, where it is not practicable to vary the speed to maintain constant inlet pressure.

Our compensator consists of a tank partly filled with water and containing a float attached to a balanced valve. A small pressure pipe leading from the inlet side of the exhauster admits the gas to the under side

of the float, and any variation in the pressure of the gas causes the float, and consequently the valve to move. If the pressure falls, the valve opens and allows a certain portion of the gas to pass back to the inlet side of the exhauster until the desired pressure is re-established.

Described in detail in Bulletin "B."

## WASHERS, EXTRACTORS AND SCRUBBERS

We furnish immersion washers, P and A. extractor and tower and rotary scrubbers for the removal of vapors from gases under light pressures.

## COOLERS

Made of steel or cast iron for the cooling of gases under light pressures using either fresh or salt water.

## PURIFIERS

Complete installations for the removal of sulphur compounds from gases under light pressures.

## UNGER AMMONIA CONCENTRATORS, AQUA AND SULPHATE PLANTS

The concentration of ammoniacal liquor is necessary in order that it may be shipped to places where the ammonia is converted into products used in the industries. Even when an ammonia refinery is situated in close vicinity to gas works, it pays the gas producer to convert the liquor into concentrate.

Complete description in Bulletin "D."

## GAS VALVES

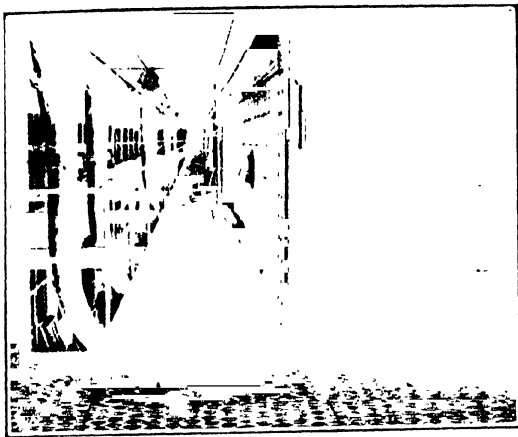
The Isbell gas valve has double gates and hand holes for cleaning on both sides. It is made entirely of iron for pressures up to 10 pounds, in sizes from 3" to 48" inclusive with either inside or outside screws. In opening the valves inclined surfaces at the top of the gate holder draw the gates together breaking contact with the seats. In closing, a toggle in the center of the gate holder forces the gates against their seats.

Where valves are required to operate frequently, and open and close instantly they can be furnished with lever, hydraulic or pneumatic cylinder, or with a variety of forms of special gearing.

Detail description in Bulletin "F."

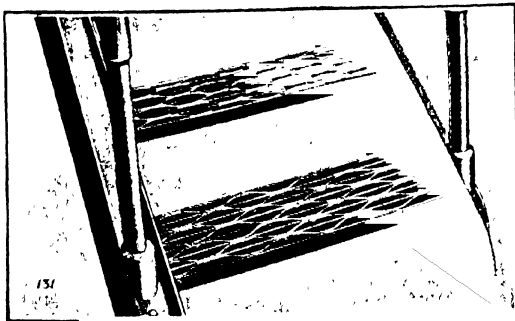


have led to its use by engineers in ever-increasing quantities for industrial purposes, some of its applications being as follows: Floors, walkways, and galleries in power plants; boiler room floors in oil-fired plants; pump platforms; covering for turbine pits, pipe trenches, and drainage sumps; floors for mine cages, freight elevators and elevator pent houses, floors or platforms around tanks or vats; charging floors, floors in gas plants and retort houses; a substitute for water-cooled plates affording maximum area; armoring of concrete surfaces; stair and ladder steps, etc. As a removable mat over a floor in laboratories or other places where sand or plaster might fall and be ground under foot and be tracked about, it offers peculiar advantages.



A GALLERY OF IRVING SUBWAY AROUND THE FURNACES IN A CHEMICAL MANUFACTURER'S PLANT

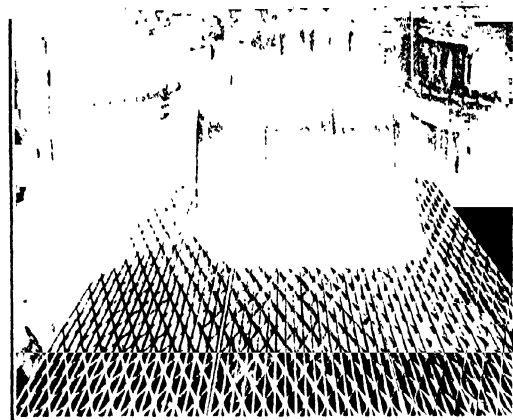
A remarkable fact about Irving Subway is that its adoption in a plant for a specific and probably obvious purpose, has almost invariably been followed by its application in the same plant for many totally different and less obvious purposes. In fact, each month seems to bring forth new applications never thought of before.



A STAIRWAY OF IRVING "SAFSTEPS" IS SAFE AND NON-SLIPPING UNDER ALL CONDITIONS

#### IRVING "SAFSTEP" STAIR STEPS

Originally a special application of Irving Subway, these "Safsteps" have gained such popularity that they



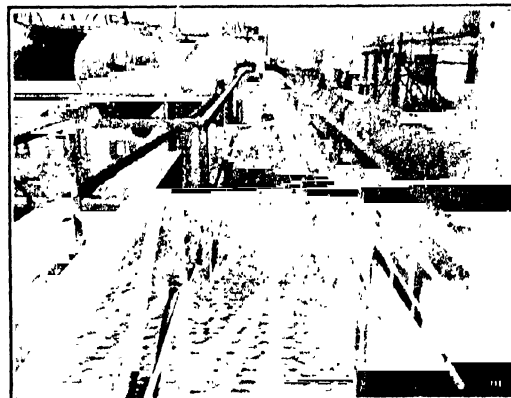
RIB-HOOPED BARRELS ROLL OVER IRVING SUBWAY AS EASILY AS OVER A SMOOTH, SOLID FLOOR

are now a standard product in the Irving line. Each step is a complete unit, with its own carriers, easily installed and more durable than any other step. You never have to "watch your step" on a ladder or stairs with Irving "Safsteps." They are absolutely non-slipping, even with oil or grease upon them. When used out of doors they cannot accumulate snow or ice (as a solid step does)—give a secure footing even in freezing weather. They cannot fill up with dirt, and are clean and sanitary.

They're strong enough for any load that may come upon them—yet so light that they need only the lightest supports. This means a big saving in first cost and in dead weight. Irving "Safsteps" are an effective form of accident insurance in any plant.

#### CATALOG

Catalog No. 3A2, sent on request, gives complete description, load rating, sizes, spans, weights and all other data—together with a list of representative users, reports of tests, and details of various applications.



A CAR LOADING PLATFORM OF IRVING SUBWAY IN A CHEMICAL PLANT—NON-SLIPPING UNDER ALL CONDITIONS

# H. JACKSON PUMP AND MFG. CO., INC.

Manufacturers and Patentees Pumping Outfits

95 SECOND AVE., BROOKLYN, N. Y.

Telephone  
6791 SOUTH

## PRODUCTS

Hand, Power and Electric Rotary Pumps. Castings of Aluminum, Composition and "Hecla" Bronze Bearing Metals. Manufacturing of every description.

## SERVICE

These pumps are admirably adapted for pumping large volumes of both light and heavy liquids against moderate heads. They are positive in their suction and discharge, self compensating as to wear, do not have to be primed and will "pick up" readily on high suction lifts.

They are being used at the present time for the pumping of water, chemicals, gasoline, benzine, turpentine, soap, tar, white lead, varnish, paint, thick mash, hot and cold beer, and many other fluids and semi-fluids.

All pumps are thoroughly tested before leaving the plant and are fully guaranteed to do the service for which they are intended.

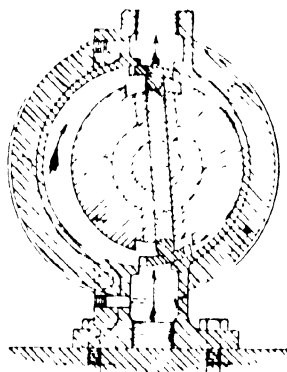
## CONSTRUCTION

The illustration shows the interior construction of both the electric and belt driven types. The revolving piston sets close to the side of the cylinder and as same revolves a vacuum is formed behind the buckets as they sweep upward, causing the material being pumped to be drawn into the cylinder at the bottom and discharged at the top. This type is fitted with but two buckets and wearing shoes which are made of bronze, whether the case be of iron or bronze.

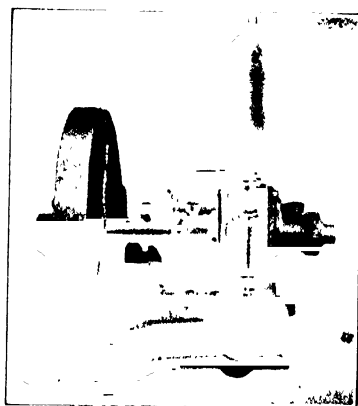
The wearing shoes which are inserted in the ends of the buckets oscillate with the bore of the cylinder, thereby greatly reducing the friction directed against the wall of the cylinder. The shoes are the only members which receive any great amount of wear and are therefore interchangeable. The buckets do not come in contact with the cylinder wall. Consequently, the only friction they receive, which is slight, is caused by their moving in and out in the piston slots. The journals are supported in interchangeable bearings which also serve as packing glands for the stuffing boxes. All bearings are lubricated by means of grease cups.

## MOTOR DRIVEN TYPE

The pump together with motor is mounted upon a substantial cast iron bedplate and is driven by a single reduction cut gear and pinion to eliminate unnecessary noise. The bedplate is capable of mounting A.C. or D.C. motors of most any manufacture. The suction is



INTERIOR CONSTRUCTION



MOTOR DRIVEN PUMP

taken from the bedplate, thus eliminating disconnecting of suction pipe, should it be found necessary to dismantle the pump. The floor space required is small. This type is suitable for 50.75 pounds per square inch pressure. Furnished with or without by-pass and air chamber. See table below for sizes and capacities. Mention unit No. 1A.

## BELT DRIVEN TYPE

Although the belt plate is considerably smaller this pump is constructed identically the same as the electric type shown above. It is fitted with tight and loose pulleys. Mention unit No. 1B.

## QUOTATIONS

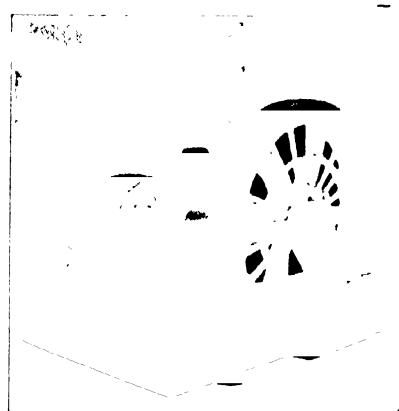
When quotations are requested on motor driven pumps kindly advise for what service the pump is to be used. Information should include voltage, whether A.C. or D.C., phase and cycles.

## SIZES AND CAPACITIES

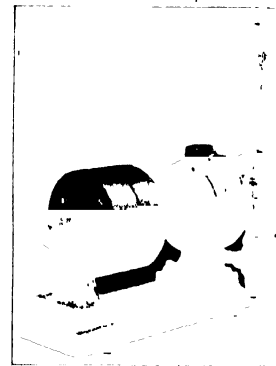
Suction pipe size	Discharge pipe size	Revolutions per min.	Displacement Gallons per min.	Pulleys	
				Dia.	Width
1"	1"	27	18	6"	1 1/2"
1 1/2"	1 1/2"	210	10	8"	2 1/2"
2"	2"	200	65	10"	2 1/2"
3"	3"	210	70	14"	3"
4"	4"	200	125	16"	4"
		200	215	18"	6"

## BARREL OR TRANSFER PUMP

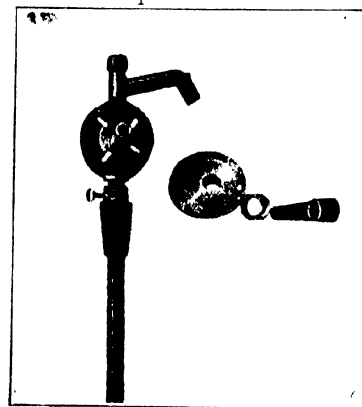
These pumps are recommended for pumping both free flowing and viscous liquids from barrels, drums, tanks, vats, etc. They are positive of suction, do not require priming and have a displacement of one pint per each revolution. They are fitted with bronze buckets, 3/8 inch suction pipe, taper bung attachment, handle and goose-neck. Connections are one inch. Weighs 26 lbs. complete with all attachments. Mention unit No. 2A.



MOTOR DRIVEN PUMP



BELT DRIVEN PUMP



BARREL OR TRANSFER PUMP

# HENRY E. JACOBY, M.E.

(Member A. S. M. E.)

**Specialist in Chemical Machinery and Equipment**

95-97 Liberty St.

NEW YORK CITY

**PRODUCTS:** Complete trains of equipment for the manufacture of chemicals of all kinds, comprising evaporators, dryers, filter presses, stills, kettles, tanks, mixers and grinders, pumps and all accessories.

## SPECIALTIES:

No matter how unique or special your piece of apparatus may be, we undoubtedly have facilities in one of our shops to manufacture it.

## EVAPORATORS:

We are the Sales Representatives in New York City and surrounding territory of Zaremba Company, and in addition to furnish evaporating equipment of all sizes, and of the latest and most improved design.

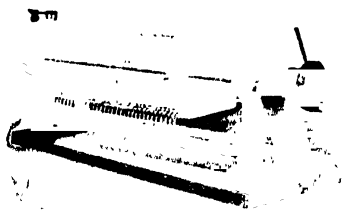


## DRYERS:

Almost fifteen years' experience in the manufacture and installation of dryers of various kinds, vacuum as well as non-vacuum, puts us in a position to be of particular service to you in the solving of your dryer problems.

## FILTER PRESSES:

As Eastern Sales Representative of D. R. Sperry & Company, we are able to supply filter press equipment of the highest quality, superior to any on the market today.



## STILLS AND KETTLES:

We build a large variety of apparatus of this type, in iron, steel, copper, lead and enamel-lined stills and kettles.

## STILLS

The illustration shows one of the special stills, selected at random, which we have manufactured. We have designed and built special stills of iron, steel, copper, aluminum, lead and enamel lined metal.



## DRY MIXERS AND GRINDERS

One of our specialties has been the manufacture of dry mixing and grinding mills of which we have supplied a large number to dye and color manufacturers. We manufacture these in sizes ranging from 18" diameter to 45" diameter drums.



## COMPLETE PLANTS:

Our numerous manufacturing connections enable us to furnish a complete train of equipment as well as any of our specialties, thereby giving the purchaser the benefit of our experience, without increased cost, insuring a properly balanced plant, and relieving him of all the responsibility of proportioning his various pieces of apparatus.

Let us quote you on your plant on a one assignment basis.

# JANOS ASBESTOS COMPANY

Manufacturers of Asbestos Products

26 Cortlandt Street  
NEW YORK, N. Y.



## PRODUCTS

Superheat Sheet Packing  
Asbestos Metallic Gaskets  
Motor Sheet Packing  
Asbestos Wick Packing  
Asbestos Gloves and Mittens, and other specialties.

### SUPERHEAT SHEET PACKING

Guaranteed for all pressures of saturated and superheated steam, acid, alkali, ammonia, naphtha, gas, gasoline, oil, air, liquids and sugar solutions. It is made of Long Fiber Asbestos, formed into sheets under tremendous pressure with correct binding material. Size of standard sheet fifty inches square, 1/32" to 1/4" thick.

### ASBESTOS METALLIC GASKETS

Made from the very best Asbestos Cloth, reinforced with fine brass wire to withstand the highest steam pressure and temperature. Furnished in all sizes and shapes.

### MOTOR SHEET PACKING

Recommended for cylinder heads on Gas and Gasoline Engines and for universal use. Made in rolls thirty-nine inches wide, 1/32" and 1/16" thick.

### ASBESTOS WICK PACKING

Is acid and fireproof and extensively used in chemical plants. It is composed of strands of the purest Asbestos Fiber and supplied in 1/2 and 1 pound balls, 1/4" thick. Tightly twisted rope furnished in 25 and 50 pound reels, 3/8" to 2" diam.

### ASBESTOS GLOVES AND MITTENS

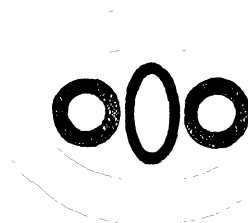
Made from heavy weight Asbestos Cloth for every industrial requirement. They are flexible, durable, heat and fluid-proof. We are prepared to make up Asbestos Leggings, Aprons, and other Asbestos Clothing for the protection to the person handling superheated articles, molten metals and corrosive acids.

### OTHER SPECIALTIES

Asbestos Blankets  
Asbestos Carded Fiber  
Asbestos Cloth, with or without wire insertion  
Asbestos Cord  
Asbestos Millboard in sheets 40 inches square  
Asbestos Paper in rolls thirty-six inches wide  
Asbestos Pipe Covering  
Asbestos Table Covers  
Asbestos Tape  
Asbestos Tubing  
Asbestos Yarn  
Asbestos Packing for high, medium and low pressure.  
Rubber Hose, Belting, Pump Valves  
Mechanical Rubber Goods.



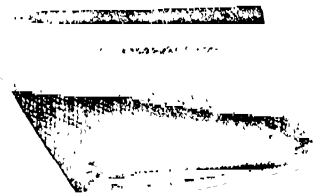
JANOS SUPERHEAT SHEET PACKING NO. 300



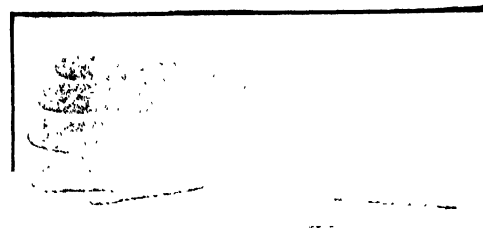
JANOS ASBESTOS  
METALLIC GASKETS



JANOS ASBESTOS  
WICK PACKING



JANOS MOTOR SHEET PACKING



JANOS ASBESTOS GLOVES

### GUARANTEE OF QUALITY

Janos products are a standard of excellence.

The trade-mark "Janos" is a guarantee of quality.

It is also an emblem of the good faith, the good will, the principles and the ideals of the manufacturers.

### INFORMATION

We will gladly furnish any information regarding our products or give our customers the benefit of our large experience in this line in the way of advice or suggestions regarding the most suitable asbestos material to meet any condition.

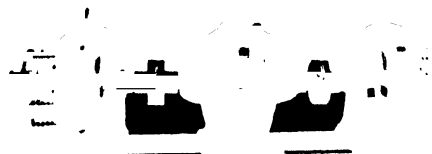
**FOR EVERY CHEMICAL INDUSTRY**

# JANTZ & LEIST ELECTRIC CO.

Manufacturers of  
Electric Motors and Generators  
WESTERN AVE. AND YORK ST., CINCINNATI, OHIO

## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.

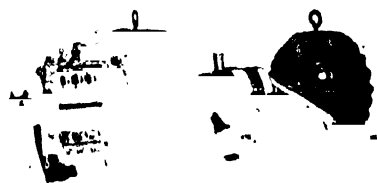


### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	2400 3-6	1200 6-12	28		
3200 1-6	1600 6-12	50	3200 3-6	1600 6-12	40		
4000 1-6	2000 6-12	50	4000 3-6	2000 6-12	50		
5000 1-6	2500 6-12	60	5000 3-6	2500 6-12	60		
7000 3-6	3500 6-12	100	7000 3-6	3500 6-12	85		
8000 5-10	4000 10-20	150	8000 3-6	4000 6-12	100		
10000 4-8	5000 8-16	150	10000 2-8	5000 4-16	150		



### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO.

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty  
From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Di	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	1	1	1 1/8	
	1000	5	4	1 1/8	
	210	5	4	1 1/8	
	220	6	5	1 1/8	
2 1/2	1000	5	3	1 1/8	
	475	5	4	1 1/8	
	475	5	4	1 1/8	
	750	6	6	1 1/8	
3	1350	5	3	1 1/8	
	450	6	4	1 1/8	
	430	6	4	1 1/8	
	285	7	5	1 1/8	
3 1/2	675	5	5	1 1/8	
	500	5	5	1 1/8	
4	175	8	5	1 1/8	
5	1000	5	5	1 1/8	
	750	6	5	1 1/8	
	400	8	5	1 1/8	
	400	9	6	1 1/8	
7 1/2	1800	5	4	1 1/8	
	1150	6	5	1 1/8	
	650	8	6	1 1/8	
	500	10	6	1 1/8	
	425	10	6	1 1/8	
10	1700	8	5	1 1/8	
	1000	8	5	1 1/8	
	750	8	6	1 1/8	
	600	8	6	1 1/8	
	400	10	8	1 1/8	
15	1350	7	6	1 1/8	
	1050	8	8	1 1/8	
	850	10	6	1 1/8	
	575	10	8	1 1/8	
	390	12	8	1 1/8	
20	800	10	8	1 1/8	
	525	12	8	1 1/8	
	475	16	10	2 1/8	
30	1200	10	8	1 1/8	
	1000	10	8	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H P	R. P. M.	Efficiency			
		100%	75%	50%	
5	1750	85	83	78	5
	1150	86	84	79	4
7 1/2	1750	86	84	79	8
	1150	87	85	80	
10	1750	87	85	80	
	1150	87	85	80	5
15	1750	87	85	80	2
	1150	87	85	80	9
20	1750	88	86	80	6
	1150	88	86	81	3
25	1750	88	86	81	5
	1150	89	87	82	
35	1750	89	87	83	3
	1150	89	87	84	
40	1750	89	87	84	3
	1150	90	89	86	2
50	1750	91	89	87	
	1150	91	89	87	
60	1750	91	90	87	
	1150	91	90	87	

# THE JEFFREY MANUFACTURING COMPANY

MAIN OFFICE AND WORKS

924 NORTH FOURTH STREET, COLUMBUS, OHIO

## BRANCH OFFICES

Buffalo, 1108 Marine Trust Bldg  
Boston, 141 Milk Street  
New York, 3010 Hudson Terminal Bldg  
Chicago, McCormick Bldg  
Denver, U. S. National Bank Bldg  
Dallas, Commonwealth National Bank Bldg

Philadelphia, Real Estate Trust Bldg  
St. Louis, Railway Exchange Bldg  
Scranton, 516 Union National Bank Bldg  
Montreal, Canada Power Bldg  
Los Angeles, Herman W. Hellman Bldg

Detroit, Hook Bldg  
Pittsburgh, Farmers Bank Bldg  
Milwaukee, M & M Bldg  
Birmingham, Brown Marx Bldg  
Cleveland, Leader News Bldg

## PRODUCTS

Crushing, Pulverizing and Shredding Machinery; Elevating and Conveying Machinery for handling all kinds of materials, including Coal and Ashes Handling Equipments, Malleable Iron and Steel Chains; Portable Loaders and Unloaders; Power Transmission Machinery; Coal and Metal Mining Machinery, Mine and Industrial Locomotives, etc.

## ENGINEERING SERVICE

As materials and processes vary to a considerable degree in every industry or chemical plant, equipment for the handling and treatment of materials should have special consideration.

Our experienced Engineers will be glad to submit recommendations and quotations upon our Standard Equipments or adaptations thereof, to suit the individual requirements of users.

## JEFFREY SWING HAMMER PULVERIZERS

Especially adaptable for the reduction of Raw and Finished Materials in Chemical Plants, for Lime, Limestone, Coal, Coke, Chemicals, Fertilizer Materials, Pitch, Nitro Coke, and similar materials.

Built in many sizes and types—adapted to the handling of a great variety of materials, with wide range of capacity and product.

Write for Catalog No. 147-H.

The Swing Hammer Pulverizer is designed to reduce by striking material in suspension as opposed to the attrition mill which mashes or rolls. While primarily used for limestone, shale, etc., it is also well adapted to pulverizing coal for coking purposes.



TYPE "A" PULVERIZER

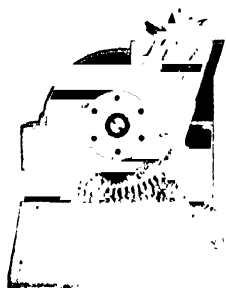


TYPE "B" PULVERIZER

## JEFFREY TYPE "A" AND TYPE "E" SWING HAMMER SHREDDERS

Especially adapted for the preparation of Fibrous Materials such as Bark, Chips, Beans, Nuts, Seed, etc., in Chemical and Extract Plants, Turpentine and Dye Works, Alcohol Plants, etc.

Catalogs Nos. 245-C and 259-A have valuable data including Plant Layouts, etc.



TYPE "A" SHREDDER



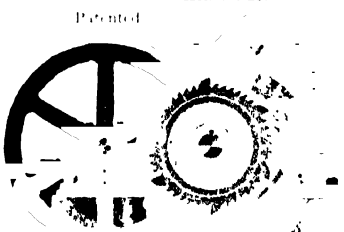
TYPE "E" BALL BEARING SHREDDER

## JEFFREY ROLL CRUSHERS

For the reduction of Coal and Coke these crushers are especially adapted to conditions requiring the handling of large capacities, reduction of large lumps, uniformity of product or other special results.

Write for Catalogs Nos. 141-Z and 248-C.

The Double Roll Crusher is used for break-down service of coal and similar materials, where the products are not required to be of quite the uniformity in sizes as obtained with the Single Roll Crusher.



SINGLE ROLL COAL CRUSHER

For sizing Coal for Stoker Use, for Preliminary to Drying and to Pulverizing Mills



DOUBLE ROLL CRUSHERS AND COKE SIZERS

For Coal, Coke and Chemicals

## DATA, JEFFREY SINGLE ROLL COAL CRUSHERS

Table of Capacities			Using Hard Bituminous Coal Such as Indiana Block								Using Medium Bituminous Coal Such as Ohio or Illinois Run-of-Mine								Using Soft Bituminous Coal Such as Pocahontas							
Size Crusher Inches	Drum R. P. M.	App'x H. P.	*Size of Product—Tons per Hr.								*Size of Product—Tons per Hr.								*Size of Product—Tons per Hr.							
			1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"		1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"		1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	
18 x 18	75	15	15	20	25	30	35	40	45	50	20	25	30	35	40	45	50	55	40	40	50	50	120	120	120	120
24 x 24	60	30	30	45	55	65	75	85	95	100	50	60	70	80	90	100	110	120	100	110	115	120	200	200	200	200
30 x 30	50	40	50	60	70	80	90	100	110	120	75	85	100	125	150	170	180	190	160	170	180	190	200	200	200	200
36 x 36	40	60	75	90	110	120	130	140	150	160	115	120	150	185	210	250	300	350	175	200	250	275	275	300	300	350

\*By "Size of Product" is meant average results, 80 to 90 per cent. pass screen indicated.  
†Horse power will vary according to exact nature of coal as to hardness, toughness, friability and moisture.

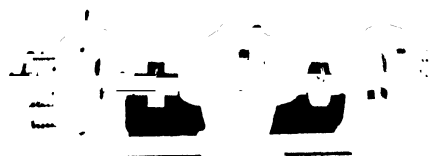
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# JANTZ & LEIST ELECTRIC CO.

Manufacturers of  
Electric Motors and Generators  
WESTERN AVE. AND YORK ST., CINCINNATI, OHIO

## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	2400 3-6	1200 6-12	28		
3200 1-6	1600 6-12	50	3200 3-6	1600 6-12	40		
4000 1-6	2000 6-12	50	4000 3-6	2000 6-12	50		
5000 1-6	2500 6-12	60	5000 3-6	2500 6-12	60		
7000 3-6	3500 6-12	100	7000 3-6	3500 6-12	85		
8000 5-10	4000 10-20	150	8000 3-6	4000 6-12	100		
10000 4-8	5000 8-16	150	10000 2-8	5000 4-16	150		



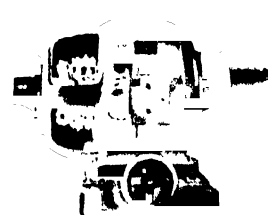
### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO. STAT

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty  
From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Di	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	1	1	1 1/8	
	1000	5	4	1 1/8	
	210	5	4	1 1/8	
	220	6	5	1 1/8	
2 1/2	1000	5	3	1 1/8	
	475	5	4	1 1/8	
	475	5	4	1 1/8	
	750	6	6	1 1/8	
3	1350	5	3	1 1/8	
	450	6	4	1 1/8	
	430	6	4	1 1/8	
	285	7	5	1 1/8	
3 1/2	675	5	5	1 1/8	
	500	5	5	1 1/8	
4	175	8	5	1 1/8	
5	1000	5	5	1 1/8	
	750	6	5	1 1/8	
	400	8	5	1 1/8	
	400	9	6	1 1/8	
7 1/2	1800	5	4	1 1/8	
	1150	6	5	1 1/8	
	650	8	6	1 1/8	
	500	10	6	1 1/8	
	425	10	6	1 1/8	
10	1700	8	5	1 1/8	
	1000	8	5	1 1/8	
	750	8	6	1 1/8	
	600	8	6	1 1/8	
	400	10	8	1 1/8	
15	1350	7	6	1 1/8	
	1050	8	8	1 1/8	
	850	10	6	1 1/8	
	575	10	8	1 1/8	
	390	12	8	1 1/8	
20	800	10	8	1 1/8	
	525	12	8	1 1/8	
	475	16	10	2 1/8	
30	1200	10	8	1 1/8	
	1000	10	8	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H. P.	R. P. M.	Efficiency			
		100%	75%	50%	
5	1750	85	83	78	5
	1150	86	84	79	4
7 1/2	1750	86	84	79	8
	1150	87	85	80	
10	1750	87	85	80	
	1150	87	85	80	5
15	1750	87	85	80	2
	1150	87	85	80	9
20	1750	88	86	80	6
	1150	88	86	81	3
25	1750	88	86	81	5
	1150	89	87	82	
35	1750	89	87	83	3
	1150	89	87	84	
40	1750	90	88	84	3
	1150	90	89	86	2
50	1750	91	89	87	
	1150	91	89	87	
60	1750	91	90	87	
	1150	91	90	87	



Jenkins Bros.

**JENKINS BROS.**  
Valves and Mechanical Rubber Goods

PRINCIPAL STORES AND OFFICES

NEW YORK, N. Y. 80 White St. BOSTON, MASS. 524 Atlantic Ave. PHILADELPHIA, PA. 133 North 7th St. CHICAGO, ILL. 646 Washington Blvd.

Washington

Pittsburgh

St. Louis

San Francisco

Havana

FACTORIES

Elizabeth, N. J.

Bridgeport, Conn.

**JENKINS BROS., LIMITED**

Canadian Factory and Head Office: Montreal, Que., 101 St. Remi Street

London Office: 6 Great Queen Street, Kingsway, W. C. 2

## PRODUCTS

Valves in Brass, All Iron, Iron Body and Cast Steel, for all pressures and purposes; Gauge Cocks, Steam Traps; Mechanical Rubber Goods, including Sheet Packing, Gaskets, Gasket Tubing, Valve Discs, Pump Valves, Union Rings and the like; Compressed Asbestos Jointing.

## JENKINS VALVES, STANDARD PATTERN

Renewable disc type.

They represent a distinct type of valve as compared with regrounding, bevel or flat-seated valves. Instead of using a solid metal clapper, they contain a disc holder of brass or other suitable metal, and a removable disc of softer material, preferably Jenkins composition disc. This disc in service presents a slightly yielding surface to the valve seat and is flexible enough to adapt itself to any slight inequalities in the seat caused by grit or sediment carried into the pipes, insuring perfect contact. Should the disc be injured, it is only necessary to remove it and replace with a new one, which can be done easily and quickly.

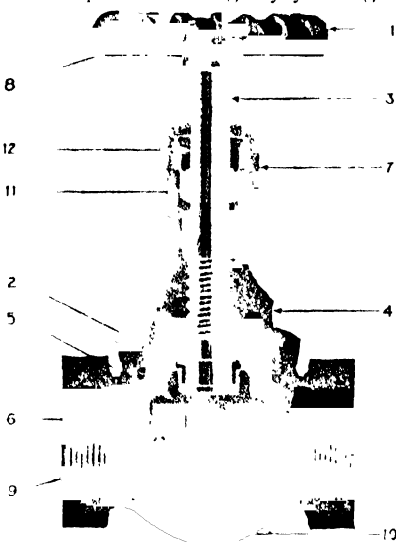
The disc takes up the wear and gives the valve practically unlimited life.

Jenkins valves have full opening. They are made of a special high grade steam metal and contain, besides the Jenkins disc, metal glands or followers in stuffing box, and other valuable features.

## BRASS VALVES, STANDARD PATTERN

**Globe, Angle and Cross Valves**—Screwed or flanged, are regularly furnished with Jenkins No. 119 discs, suitable for 150 lbs. working steam pressure. When specified for cold water, valves are fitted with No. 93 discs, suitable for working water pressure up to 250 lbs. Regular sizes  $\frac{1}{8}$  to 3 ins. Larger sizes in brass made from special patterns.

**Check Valves**—Jenkins brass horizontal, angle and vertical check valves correspond to same standard as the standard pattern globe and angle valves.



SECTIONAL VIEW OF JENKINS BRASS GLOBE VALVE, STANDARD PATTERN, FIG. 106

Description of Parts		
1 Wheel	6 Disc	10 Body
2 Lock Nut	7 Packing Nut	11 Stuffing Box
3 Spindle	8 Wheel Nut	12 Gland or
4 Bonnet	9 Disc Remov-	ing Nut
5 Disc Holder		13 Follower

Regularly furnished with Jenkins disc of semihard composition which will soften slightly under the action of hot water as required for boiler feed lines. When specified for cold water, cold liquids, air or gas, a softer and more flexible rubber disc is supplied, usually Jenkins No. 93 composition. Suitable for 150 lbs working pressure. Sizes  $\frac{1}{8}$  to 3 ins., screwed or flanged.



Fig. 117 HORIZONTAL



Fig. 118 ANGLE



Fig. 119 VERTICAL



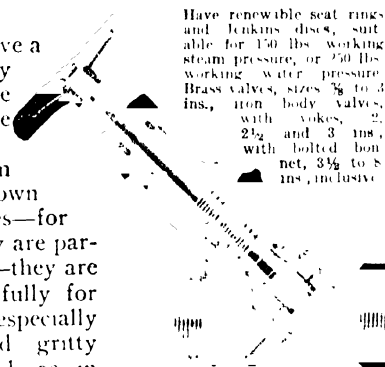
Fig. 352 SWING CHECK

## BRASS SWING CHECK VALVES, STANDARD

Jenkins brass swing check valves, standard pattern, are made with globe shaped bodies, adapted for either horizontal or vertical installation; have renewable disc feature same as the horizontal pattern; and are suitable for same working pressures. Sizes  $\frac{1}{8}$  to 3 ins., screwed or flanged.

## "Y" VALVES

These valves have a full opening nearly in line with the pipe, and offer little resistance to the free flow of steam or fluids. Best known as blow-off valves—for which service they are particularly adapted—they are also used successfully for other purposes, especially where thick and gritty fluids are handled, as in sugar refineries, pulp and paper mills, chemical and dye works.



BRASS "Y" VALVE Standard Pattern

Have renewable seat rings and Jenkins discs, suitable for 150 lbs working steam pressure, or 250 lbs working water pressure. Brass valves, sizes  $\frac{1}{8}$  to 3 ins., with body valves with yokes, 2, 2½ and 3 ins., with bolted bonnet, 3½ to 8 ins., inclusive.

## DIMENSIONS OF STANDARD PATTERN BRASS VALVES

SIZE, INS.	FIG.	A	1½	2	2½	3	4	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Globe, ser. ....	106	A 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Globe, flg. ....	107	B 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Angle, ser. ....	108	C 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Angle, flg. ....	109	D 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Globe, ser. or flg.	106-107	E 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Angle, ser. or flg.	108-109	F 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Horiz. check, ser.	117	A 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Horiz. check, flg.	118	B 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Angle check, ser.	120A	C 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Angle check, flg.	120B	D 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Horiz. and angle	117-120	GC 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Vertical, ser. ....	119	HC 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Vertical, flg. ....	120R	I 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Y, ser. ....	124	A 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Y, flg. ....	125	B 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Y, ser. or flg. ....	124-125	G 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Swing check, ser.	352	A 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Swing check, flg.	353	B 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200
Swing check, ser. or flg. ....	352-353	GC 1½	2½	3	3½	4	4½	5	6	8	10	12	14	16	18	20	24	30	36	48	60	72	96	120	144	180	240	300	360	480	600	720	960	1200

•A—Face to face, screwed

B—Face to face, flanged

C—Angle, center to face, screwed

D—Angle, center to face, flanged

G—Center to top of hand wheel, open

GC—Center to top of cap

HC—Vertical, face to face, screwed

I—Vertical, face to face, flanged

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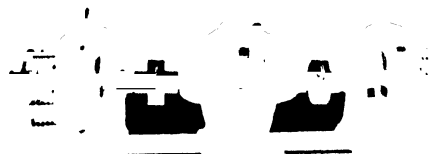


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### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	2400 3-6	1200 6-12	28		
3200 1-6	1600 6-12	50	3200 3-6	1600 6-12	40		
4000 1-6	2000 6-12	50	4000 3-6	2000 6-12	50		
5000 1-6	2500 6-12	60	5000 3-6	2500 6-12	60		
7000 3-6	3500 6-12	100	7000 3-6	3500 6-12	85		
8000 5-10	4000 10-20	150	8000 3-6	4000 6-12	100		
10000 4-8	5000 8-16	150	10000 2-8	5000 4-16	150		



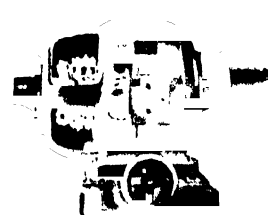
### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO. STAT

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty  
From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Di	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	1	1	1 1/8	
	1000	5	4	1 1/8	
	210	5	4	1 1/8	
	220	6	5	1 1/8	
2 1/2	1000	5	3	1 1/8	
	475	5	4	1 1/8	
	475	5	4	1 1/8	
	750	6	6	1 1/8	
3	1350	5	3	1 1/8	
	450	6	4	1 1/8	
	430	6	4	1 1/8	
	285	7	5	1 1/8	
3 1/2	675	5	5	1 1/8	
	500	5	5	1 1/8	
4	175	8	5	1 1/8	
5	1000	5	5	1 1/8	
	750	6	5	1 1/8	
	400	8	5	1 1/8	
	400	9	6	1 1/8	
7 1/2	1800	5	4	1 1/8	
	1150	6	5	1 1/8	
	650	8	6	1 1/8	
	500	10	6	1 1/8	
	425	10	6	1 1/8	
10	1700	8	5	1 1/8	
	1000	8	5	1 1/8	
	750	8	6	1 1/8	
	600	8	6	1 1/8	
	400	10	8	1 1/8	
15	1350	7	6	1 1/8	
	1050	8	8	1 1/8	
	850	10	6	1 1/8	
	575	10	8	1 1/8	
	390	12	8	1 1/8	
20	800	10	8	1 1/8	
	525	12	8	1 1/8	
	475	16	10	2 1/8	
30	1200	10	8	1 1/8	
	1000	10	8	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H. P.	R. P. M.	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7 1/2	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.4	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91	89.7	89
	1150	91.2	90	87
60	1750	91.3	90	87

Fig. 160a  
Globe, screwedFig. 162  
Globe, flangedFig. 164  
Angle, flanged

### IRON BODY GLOBE AND ANGLE VALVES, EXTRA HEAVY PATTERN DIMENSIONS IRON BODY GLOBE, ANGLE, CHECK AND Y VALVES, EXTRA HEAVY PATTERN

Size, in.	Fig.	* 1/4	1/2	3/4	1	1 1/2	2	3	4	4 1/2
Globe, ser.	160A	A	7 1/4	9	11 1/4	13 1/2	15 1/4	17 1/2	19 1/4	21 1/2
Globe, flg.	162	B	6	10	10 1/4	12 1/2	14 1/4	16 1/2	18 1/4	20 1/2
Angle, ser.	163	C	7 1/4	10 1/2	12 1/4	14 1/2	16 1/4	18 1/2	20 1/4	22 1/2
Angle, flg.	164	D	6 1/2	9 1/2	10 1/4	12 1/2	14 1/4	16 1/2	18 1/4	20 1/2
Globe, ser. or flg.	160A-162	G	13 1/4	14 1/2	15 1/4	16 1/2	17 1/4	18 1/2	19 1/4	20 1/2
Angle, ser. or flg.	163A-164	G	14 1/2	15 1/4	16 1/2	17 1/4	18 1/2	19 1/4	20 1/2	21 1/2
Horiz. check, ser.	265	A	6 1/4	9	10 1/4	11 1/2	12 1/4	13 1/2	14 1/4	15 1/2
Horiz. check, flg.	266	B	6	10	10 1/4	11 1/2	12 1/4	13 1/2	14 1/4	15 1/2
Angle check, ser.	267	C	7 1/4	10 1/2	12 1/4	14 1/2	16 1/4	18 1/2	20 1/4	22 1/2
Angle check, flg.	268	D	6 1/2	9 1/2	10 1/4	12 1/2	14 1/4	16 1/2	18 1/4	20 1/2
Horiz. and angle	265-268	G	14 1/2	15 1/4	16 1/2	17 1/4	18 1/2	19 1/4	20 1/2	21 1/2
Swing check, ser.	338	A	7 1/4	9	10 1/4	11 1/2	12 1/4	13 1/2	14 1/4	15 1/2
Swing check, flg.	339	B	6	10	10 1/4	11 1/2	12 1/4	13 1/2	14 1/4	15 1/2
Swing check, ser. or flg.	338-339	G	14 1/2	15 1/4	16 1/2	17 1/4	18 1/2	19 1/4	20 1/2	21 1/2
Y or blow off, ser.	336	A	9	10 1/2	11 1/4	12 1/2	13 1/4	14 1/2	15 1/4	16 1/2
Y or blow off, flg.	337	B	10 1/4	11 1/2	12 1/4	13 1/2	14 1/4	15 1/2	16 1/4	17 1/2
Y or blow off, ser. or flg.	336-337	G	14 1/2	15 1/4	16 1/2	17 1/4	18 1/2	19 1/4	20 1/2	21 1/2

Size, in. (Continued)	Fig.	* 1/4	1/2	3/4	1	1 1/2	2	3	4	4 1/2
Globe, ser.	160A	A	15	17	18 1/2	19 1/2	21	23	26	28
Globe, flg.	162	B	13 1/2	17	18 1/2	20	21 1/4	23	26	28
Angle, ser.	163	C	15 1/2	18 1/2	20	21 1/4	23	26	28	30
Angle, flg.	164	D	13 1/2	17	18 1/2	20	21 1/4	23	26	28
Globe, ser. or flg.	160A-162	G	19 1/4	21 1/4	23 1/4	25 1/4	27 1/4	29 1/4	31 1/4	33 1/4
Angle, ser. or flg.	163A-164	G	20 1/4	22 1/4	24 1/4	26 1/4	28 1/4	30 1/4	32 1/4	34 1/4
Horiz. check, ser.	265	A	15	17	18 1/2	19 1/2	21	23	26	28
Horiz. check, flg.	266	B	13 1/2	17	18 1/2	20	21 1/4	23	26	28
Angle check, ser.	267	C	15 1/2	18 1/2	20	21 1/4	23	26	28	30
Angle check, flg.	268	D	13 1/2	17	18 1/2	20	21 1/4	23	26	28
Horiz. and angle	265-268	G	21 1/4	23 1/4	25 1/4	27 1/4	29 1/4	31 1/4	33 1/4	35 1/4
Swing check, ser.	338	A	15	17	18 1/2	19 1/2	21	23	26	28
Swing check, flg.	339	B	13 1/2	17	18 1/2	20	21 1/4	23	26	28
Swing check, ser. or flg.	338-339	G	21 1/4	23 1/4	25 1/4	27 1/4	29 1/4	31 1/4	33 1/4	35 1/4

\*A. Face to face, screwed. D. Angle, center to face, flanged.  
B. Face to face, flanged. G. Center to top of hand wheel, open.  
C. Angle, center to face, screwed. H. Center to top of cap.

### CAST STEEL VALVES

To meet the requirements of high pressure superheated steam and hydraulic service, Jenkins Bros. manufacture a line of cast steel valves. The globe, angle and cross valves have bodies and bonnets of cast steel, and the spindles, seat rings, discs and disc rings are of monel metal. All connecting flanges are made with 1/16 in. raised faces inside of bolt holes. When ordered with flanges faced and drilled, the bolt holes will always be spot faced unless otherwise specified. Globe, angle, cross and swing check valves in sizes 2 to 12 ins., inclusive, suitable for working steam pressure up to 350 lbs., and total temperature of 800° F.\*

\* See also Cast Steel Gate Valves.

### JENKINS GATE VALVES\*

**Standard Pattern**—Brass, sizes 1/4 to 3 ins. Iron body, sizes 2 to 30 ins. For working pressures 125 lbs. steam, 175 lbs. water. All-iron—sizes 1/4 to 30 ins.

**Medium Pressure Pattern**—Brass, sizes 1/4 to 3 ins. Iron body, sizes 2 to 18 ins. For working pressures 175 lbs. steam, 250 lbs. water.

**Extra Heavy Pattern**—Brass, sizes 1/2 to 3 ins. Iron body, sizes 1 1/2 to 24 ins. For working pressures 250 lbs. steam, 400 lbs. water.

**Extra Heavy Pattern**—Cast steel, sizes 1 1/2 to 24 ins. For working pressures 350 lbs. steam, and total temperature of 800° Fahr.

All Jenkins gate valves are of the solid wedge, double face type. The bodies are globe shaped, of great strength, and good proportions. All patterns are made with inside screw, stationary spindle, or outside screw and yoke, rising spindle. The latter are particularly

\* See also All Iron Valves.

recommended for the higher pressures, as the spindle is more easily lubricated, increasing its durability. The traveling spindle also serves to indicate whether the valve is open or closed. All the valves can be repacked under pressure when wide open, and all parts are renewable and interchangeable. The iron body and cast steel valves in the larger sizes are made with or without by-pass.

Valves can also be furnished with hub ends and square head stem, spur, bevel or special gearing, floor stands or indicator posts, and various other operating mechanisms.

Fig. 370  
Standard patternFig. 372  
Standard patternFig. 280  
Standard patternFig. 281  
Extra heavy patternFig. 282  
Extra heavy pattern

### BRASS GATE VALVES

Standard Pattern

Size, ins.	Fig.	* 1/4	1/2	3/4	1	1 1/2	2	3
I. S. ser.	370	A	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
I. S. flg.	371	B	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
I. S. ser. or flg.	370-371	G	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
O. S. and Y.	365	C	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
O. S. and Y.	368	H	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4

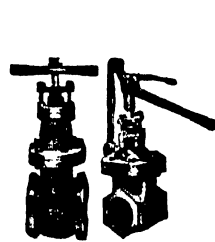
Medium Pattern

Size, ins.	Fig.	* 1/4	1/2	3/4	1	1 1/2	2	3
I. S. ser.	370	A	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
I. S. flg.	371	B	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
I. S. ser. or flg.	370-371	G	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
O. S. and Y.	365	C	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
O. S. and Y.	368	H	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4

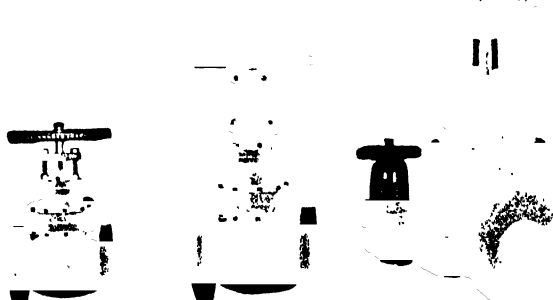
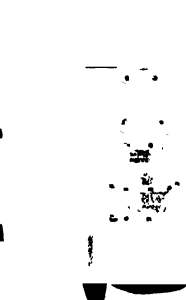
Extra Heavy Pattern

Size, ins.	Fig.	* 1/4	1/2	3/4	1	1 1/2	2	3
I. S. ser.	380	A	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
I. S. flg.	381	B	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
I. S. ser. or flg.	380-381	G	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
O. S. and Y.	382	C	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4
O. S. and Y.	383	H	1 1/4	1 1/2	1 3/4	2 1/4	3 1/4	4 1/4

\*A. Face to face, screwed. G. Center to top of hand wheel, open.  
B. Face to face, flanged. H. Center to top of spindle, rising spindle open.

Fig. 325  
Inside screwFig. 334  
Quick opening sliding stem and leverFig. 327  
Hub endsFig. 331  
With yokeFig. 346  
With spur gearFig. 348  
With bevel gear

### IRON BODY GATE VALVES STANDARD PATTERN

Fig. 203  
Inside screw, stationary spindle without by-passFig. 204  
O. S. and Y. rising spindle without by-passFig. 204b  
O. S. and Y. rising spindle with by-pass

### IRON BODY GATE VALVES, EXTRA HEAVY

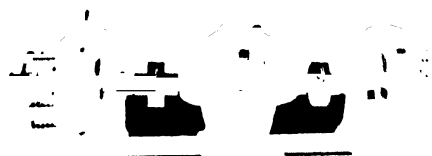
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# JANTZ & LEIST ELECTRIC CO.

Manufacturers of  
Electric Motors and Generators  
WESTERN AVE. AND YORK ST., CINCINNATI, OHIO

## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	35	2400 3-6	1200 6-12	28	28
3200 1-6	1600 6-12	50	50	3200 3-6	1600 6-12	40	40
4000 1-6	2000 6-12	50	50	4000 3-6	2000 6-12	50	50
5000 1-6	2500 6-12	60	60	5000 3-6	2500 6-12	60	60
7000 3-6	3500 6-12	100	100	7000 3-6	3500 6-12	85	85
8000 5-10	4000 10-20	150	150	8000 3-6	4000 6-12	100	100
10000 4-8	5000 8-16	150	150	10000 2-8	5000 4-16	150	150



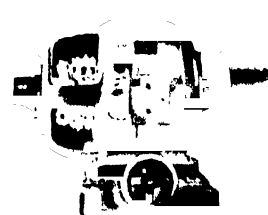
### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO. STAT

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty  
From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Di	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	1	1	1 1/8	
	1000	5	4	1 1/8	
	210	5	4	1 1/8	
	220	6	5	1 1/8	
2 1/2	1000	5	3	1 1/8	
	475	5	4	1 1/8	
	475	5	4	1 1/8	
	750	6	6	1 1/8	
3	1350	5	3	1 1/8	
	450	6	4	1 1/8	
	430	6	4	1 1/8	
	285	7	5	1 1/8	
3 1/2	675	5	5	1 1/8	
	500	5	5	1 1/8	
4	175	8	5	1 1/8	
5	1000	5	5	1 1/8	
	750	6	5	1 1/8	
	400	8	5	1 1/8	
	400	9	6	1 1/8	
7 1/2	1800	5	4	1 1/8	
	1150	6	5	1 1/8	
	650	8	6	1 1/8	
	500	10	6	1 1/8	
	425	10	6	1 1/8	
10	1700	8	5	1 1/8	
	1000	8	5	1 1/8	
	750	8	6	1 1/8	
	600	8	6	1 1/8	
	400	10	8	1 1/8	
15	1350	7	6	1 1/8	
	1050	8	8	1 1/8	
	850	10	6	1 1/8	
	575	10	8	1 1/8	
	390	12	8	1 1/8	
20	800	10	8	1 1/8	
	525	12	8	1 1/8	
	475	16	10	2 1/8	
30	1200	10	8	1 1/8	
	1000	10	8	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H P	R. P. M.	Efficiency			
		100%	75%	50%	
5	1750	85	83	78	5
	1150	86	84	79	4
7 1/2	1750	86	84	79	8
	1150	87	85	80	
10	1750	87	85	80	
	1150	87	85	80	5
15	1750	87	85	80	2
	1150	87	85	80	9
20	1750	88	86	80	6
	1150	88	86	81	3
25	1750	88	86	81	5
	1150	89	87	82	
35	1750	89	87	83	3
	1150	89	87	84	
40	1750	90	88	84	3
	1150	90	89	86	2
50	1750	91	89	87	
	1150	91	89	87	
60	1750	91	90	87	
	1150	91	90	87	



# JEWELL POLAR COMPANY

Polarstil

565-H West Van Buren Street

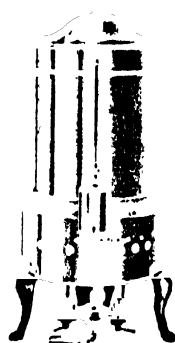
CHICAGO, ILL.

## PRODUCTS

Apparatus for distilling, filtering, sterilizing, aerating, softening and storing water.

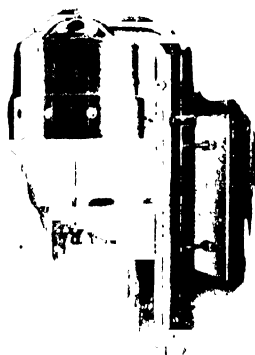
## USES

To provide chemically pure, sterile, palatable and soft water for chemical, pharmaceutical, surgical, drinking and commercial purposes.



**GAS LABORATORY STILL**

Sizes 1, 2 and 3 gallons per hour



**WALL TYPE LABORATORY STILL**

Gas operated. Sizes  $\frac{1}{2}$ , 1,  $1\frac{1}{2}$  and 2 gallons per hour

## DESCRIPTIVE

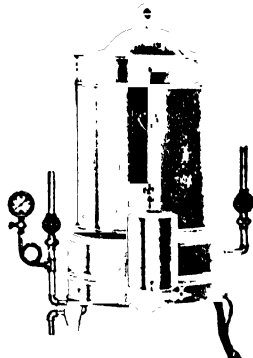
Polarstils offer a simple, permanent and economical means for providing distilled water for any particular purpose.

The valuable, exclusive features of these stills, which are recognized by Chemists and Engineers, are the result of over 40 years of practical experience in all branches of water purification.

A list of users of Jewell Polar Products is a roster of many of the world's best known industrial and other institutions.

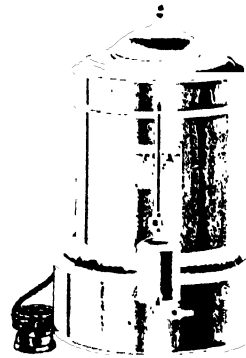
## INDUSTRIAL WATER DISTILLING PLANTS

Steam operated, sizes 15 to 1000 gallons per hour. Larger plants designed and built on order. Compact, automatic and dependable installations with or without storage tanks



**STEAM LABORATORY STILL**

Sizes 2, 5 and 10 gallons per hour



**ELECTRIC LABORATORY STILL**

Sizes 1, 2 and 3 gallons per hour

## MATERIAL

All Polarstils are made of heavy cold rolled copper and brass with pure block tin interiors.

## GUARANTEES

Material, workmanship, purity of distillate and performance fully guaranteed.

## SOME NOTABLE FEATURES

Automatic removal of gases and odors before raw water enters evaporator.

No condensing tubes to get lined up or leaky.

All parts easily accessible and interchangeable. Steam coil easily removed for cleaning.

Large plants may be operated single or double effect. Conform to any building or piping arrangements.

## SOME USERS

General Motors Corp., Saginaw, Mich.  
Penn. Salt Mfg. Co., Wyandotte, Mich.  
Battle Creek Sanitarium, Battle Creek, Mich.  
Allegheny Steel Co., Brackenridge, Pa.  
Butterworth-Judson Corp., New York, N. Y.  
Becker Steel Co. of America, Charleston, W. Va.  
Bethlehem Steel Co., Sparrow's Point, Md.  
French Lick Springs Hotel, French Lick, Ind.  
Western States Portland Cement Co., Independence, Kan.  
Scullyn Steel Co., St. Louis, Mo.  
Canadian Consolidated Rubber Co., Inc., Port Dalhousie, Ont.  
Mallinckrodt Chemical Works, St. Louis, Mo.  
Roessler & Hasslacher Chemical Co., Perth Amboy, N. J.  
Standard Gauge Steel Co., Beaver Falls, Pa.  
The Newport Company, Carrollville, Wis.  
Kellogg Products, Inc., Buffalo, N. Y.

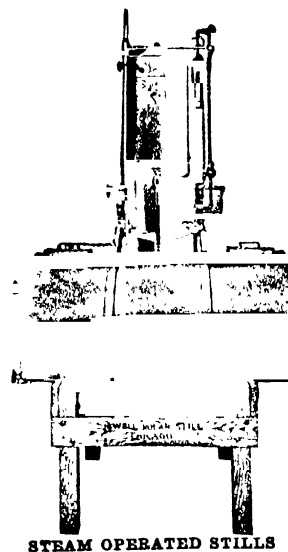
are among those who have adopted the Polarstil.

Over 400 vessels are equipped with Polarstils.

They may be installed in connection with any circulating or refrigerating apparatus.

## LITERATURE

We publish descriptive literature of our products, which we will gladly send on request.



**STEAM OPERATED STILL**

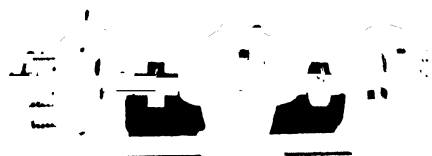
Capacities, 15 to 1000 gallons per hour

# JANTZ & LEIST ELECTRIC CO.

Manufacturers of  
Electric Motors and Generators  
WESTERN AVE. AND YORK ST., CINCINNATI, OHIO

## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.

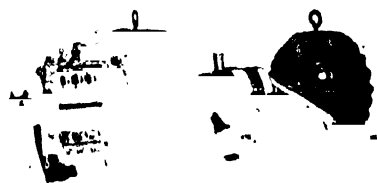


### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	35	2400 3-6	1200 6-12	28	28
1200 1-6	1600 6-12	50	50	3200 3-6	1600 6-12	40	40
1000 1-6	2000 6-12	50	50	4000 3-6	2000 6-12	50	50
5000 1-6	2500 6-12	60	60	5000 3-6	2500 6-12	60	60
7000 3-6	3500 6-12	100	100	7000 3-6	3500 6-12	85	85
8000 5-10	4000 10-20	150	150	8000 3-6	4000 6-12	100	100
10000 4-8	5000 8-16	150	150	10000 2-8	5000 4-16	150	150



### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO. STAT

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty  
From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Di	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	1	1	1 1/8	
	1000	5	4	1 1/8	
	210	5	4	1 1/8	
	220	6	5	1 1/8	
2 1/2	1000	5	3	1 1/8	
	475	5	4	1 1/8	
	475	5	4	1 1/8	
	750	6	6	1 1/8	
3	1350	5	3	1 1/8	
	450	6	4	1 1/8	
	430	6	4	1 1/8	
	285	7	5	1 1/8	
3 1/2	675	5	5	1 1/8	
	500	5	5	1 1/8	
4	175	8	5	1 1/8	
5	1000	5	5	1 1/8	
	750	6	5	1 1/8	
	400	8	5	1 1/8	
	400	9	6	1 1/8	
7 1/2	1800	5	4	1 1/8	
	1150	6	5	1 1/8	
	650	8	6	1 1/8	
	500	10	6	1 1/8	
	425	10	6	1 1/8	
10	1700	8	5	1 1/8	
	1000	8	5	1 1/8	
	750	8	6	1 1/8	
	600	8	6	1 1/8	
	400	10	8	1 1/8	
15	1350	7	6	1 1/8	
	1050	8	8	1 1/8	
	850	10	6	1 1/8	
	575	10	8	1 1/8	
	390	12	8	1 1/8	
20	800	10	8	1 1/8	
	525	12	8	1 1/8	
	475	16	10	2 1/8	
30	1200	10	8	1 1/8	
	1000	10	8	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H P	R. P. M.	Efficiency			
		100%	75%	50%	
5	1750	85	83	78	5
	1150	86	84	79	4
7 1/2	1750	86	84	79	8
	1150	87	85	80	
10	1750	87	85	80	
	1150	87	85	80	5
15	1750	87	85	80	2
	1150	87	85	80	9
20	1750	88	86	80	6
	1150	88	86	81	3
25	1750	88	86	81	5
	1150	89	87	82	
35	1750	89	87	83	3
	1150	89	87	84	
40	1750	90	88	84	3
	1150	90	89	86	2
50	1750	91	89	87	
	1150	91	89	87	
60	1750	91	90	87	
	1150	91	90	87	

# W. A. JONES FOUNDRY & MACHINE CO.

## Speed Reducers and General Power Transmission Machinery

### 1103 WEST ROOSEVELT ROAD, CHICAGO, ILL.

BRANCH OFFICE AND WAREHOUSE 29 MURRAY STREET, NEW YORK, N. Y.

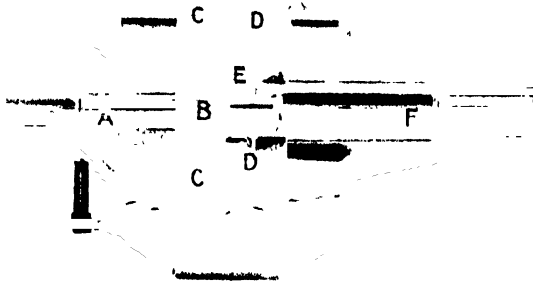
#### PRODUCTS

Spur and Worm Gear Speed Reducers; Cut Gears of Cast Iron, Cast Steel, Forged Steel and Bronze; Noiseless Pinions; Elevators and Conveyors; Cast Gears and Sprocket Wheels; Cast Iron Pulleys, Solid and Split; Ball Bearing Loose Pulleys; Friction Clutch Pulleys; Hangers; Pillow Blocks; Couplings, Rigid and Flexible; Safety Set Collars, Solid and Split.

Also Rope Sheaves, Ball Bearings, Roller Bearings, and other General Power Transmitting Machinery.

#### SPUR GEAR SPEED REDUCERS

Jones spur gear reducers are designed for use between electric motors and driven machines or shafts. They are a great improvement on belts, open gears and other cumbersome methods, and are now being used very generally in many industries.



SECTIONAL VIEW, JONES SPUR GEAR SPEED REDUCER, SINGLE TYPE

A singularly compact installation has been made possible by placing the drive and driven shafts on the same center line, and mounting three countershafts around them, evenly spaced and at equal distances from the drive and driven shafts. The housing is shown in section, so that only the upper of the three countershafts is visible. The pinion B, mounted on the high speed shaft A, meshes with and drives the three gears C, which are integral with the three pinions D. These mesh with and drive the gear E, which is mounted on the slow speed shaft F. Just plain spur gear drives, with no internal gears or overhung shafts.

The adaptability of the Jones reducer is increased by the dustproof, oil-tight housing, which completely



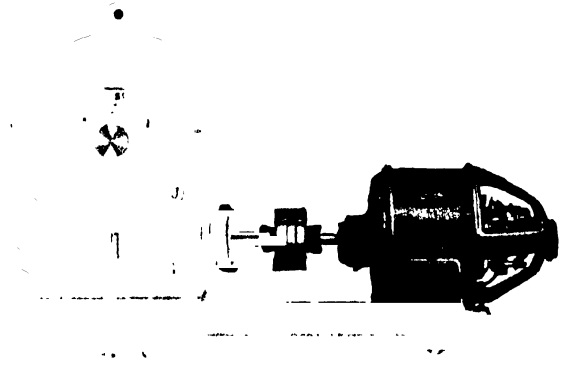
JONES SPUR GEAR SPEED REDUCER AND MOTOR MOUNTED ON CAST IRON BASE

encloses the entire mechanism. This complies with all safety laws. Special analysis steel in all gears makes for long life.

#### WORM GEAR SPEED REDUCERS

Jones worm gear speed reducers are either furnished with standard shaft projections for connecting to motors and driven units, or they can be mounted on cast iron bases with flexible couplings, with or without motors. Ball bearing thrust collars are provided at each end of the worm, which is made solid on the worm shaft. The housing is oiltight; therefore the drive can operate in lubricant continually.

The teeth of the gears are accurately cut on hobbing machines, and the threads of the worm are made on a



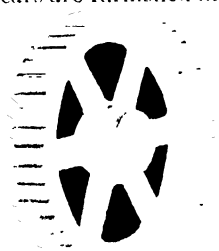
WORM GEAR SPEED REDUCER WITH MOTOR MOUNTED ON CAST IRON BASE

thread miller. Every drive is provided with an oil gage, grease cups for the gear shaft bearings, stuffing boxes for the worm shaft, and an eyebolt to aid in transporting the drive.

Our engineers will gladly assist in any speed reducing problem.

#### GEARS AND SPROCKET WHEELS

Jones cast gears are molded from patterns, accurately bored, faced on end of hub, and keyseated or set-screwed. They are furnished in cast iron, cast steel, or any other material used for the purpose, as spurs, bevels, miters, worm gears or worms, and are very serviceable for slow speeds. Cut gears are furnished in spurs, bevels, miters, worms, worm gears or spirals, made of cast iron, cast steel, forged steel, bronze, Bakelite, rawhide, or any other material used for the purpose. They can be used under working loads approximately one-third greater than is allowed for cast teeth. Send for our gear catalog, which lists about 2,000 standard patterns.



JONES SPUR GEAR

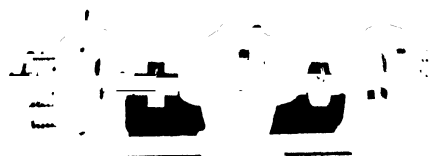
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# JANTZ & LEIST ELECTRIC CO.

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## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	35	2400 3-6	1200 6-12	28	28
1200 1-6	1600 6-12	50	50	3200 3-6	1600 6-12	40	40
1000 1-6	2000 6-12	50	50	4000 3-6	2000 6-12	50	50
5000 1-6	2500 6-12	60	60	5000 3-6	2500 6-12	60	60
7000 3-6	3500 6-12	100	100	7000 3-6	3500 6-12	85	85
8000 5-10	4000 10-20	150	150	8000 3-6	4000 6-12	100	100
10000 4-8	5000 8-16	150	150	10000 2-8	5000 4-16	150	150



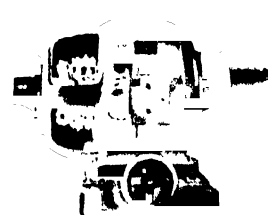
### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO.

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Di	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	1	1	1 1/8	
	1000	5	4	1 1/8	
	210	5	4	1 1/8	
	220	6	5	1 1/8	
2 1/2	1000	5	3	1 1/8	
	475	5	4	1 1/8	
	475	5	4	1 1/8	
	750	6	6	1 1/8	
3	1350	5	3	1 1/8	
	450	6	4	1 1/8	
	430	6	4	1 1/8	
	285	7	5	1 1/8	
3 1/2	675	5	5	1 1/8	
	500	5	5	1 1/8	
4	135	8	5	1 1/8	
5	1000	5	5	1 1/8	
	750	6	5	1 1/8	
	400	8	5	1 1/8	
	400	9	6	1 1/8	
7 1/2	1800	5	4	1 1/8	
	1150	6	5	1 1/8	
	650	8	6	1 1/8	
	500	10	6	1 1/8	
	425	10	6	1 1/8	
10	1700	8	5	1 1/8	
	1000	8	5	1 1/8	
	750	8	6	1 1/8	
	600	8	6	1 1/8	
	400	10	8	1 1/8	
15	1350	7	6	1 1/8	
	1050	8	8	1 1/8	
	850	10	6	1 1/8	
	575	10	8	1 1/8	
	390	12	8	1 1/8	
20	800	10	8	1 1/8	
	525	12	8	1 1/8	
	475	16	10	2 1/8	
30	1200	10	8	1 1/8	
	1000	10	8	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H P	R. P. M.	Efficiency			
		100%	75%	50%	
5	1750	85	83	78	5
	1150	86	84	79	4
7 1/2	1750	86	84	79	8
	1150	87	85	80	
10	1750	87	85	80	
	1150	87	85	80	5
15	1750	87	85	80	2
	1150	87	85	80	9
20	1750	88	86	80	6
	1150	88	86	81	3
25	1750	88	86	81	5
	1150	89	87	82	
35	1750	89	87	83	3
	1150	89	87	84	
40	1750	89	87	84	3
	1150	90	89	86	2
50	1750	91	89	87	
	1150	91	89	87	
60	1750	91	90	87	
	1150	91	90	87	

# JOHNSON SERVICE COMPANY

Temperature Regulation and Humidity Control

MILWAUKEE, WIS.

## BRANCHES

Boston, Mass., 41 Waldo Street  
Buffalo, N. Y., Erie County Bank Building  
Chicago, Ill., 177 North Dearborn Street  
Cincinnati, Ohio, 406 Gewyria Building  
Cleveland, Ohio, 2028 E. 2nd Street  
Denver, Colo., 517 Boston Building  
Des Moines, Iowa, 240 Masonic Temple  
Detroit, Mich., 42 Michigan Street West  
Indianapolis, Ind., 141 Pendrooke Arcade  
Kansas City, Mo., 411 East Tenth Street  
Milwaukee, Wis., 149 Michigan Street

Los Angeles, Cal., 605 Van Nuys Building  
Minneapolis, Minn., 308 Third Avenue South  
New York, N. Y., 118 East Twenty eighth Street  
Omaha, Neb., 609 Paxton Building  
Philadelphia, Pa., 1521 Sansom Street  
Pittsburgh, Pa., Century Building  
Portland, Ore., 404 Fading Building  
San Francisco, Cal., 417 Hault Building  
Seattle, Wash., 452 Colman Building  
St. Louis, Mo., 14 North Twelfth Street  
Salt Lake City, Utah, 301 Templeton Building

## CANADIAN REPRESENTATIVE

JOHNSON TEMPERATURE REGULATING COMPANY OF CANADA, LIMITED

## OFFICES

Calgary, Alta., 605 Second Street West  
Montreal, Que., 284 Beaver Hall Hill

Toronto, Ont., 118 Adelaide Street West  
Winnipeg, Man., 259 Stanley Street  
Vancouver, B. C., 550 Sixth Ave. W.

## PRODUCTS AND SERVICES

Manufacturers of Thermostats and Other Apparatus for the Control of Temperature and Humidity, including:

Thermostats and Humidostats.  
"Sylphon" Metal Diaphragm and Rubber Diaphragm Valves.  
Air and Water Reducing Valves.  
Pneumatic Switches or Push Buttons.

Engineers and Contractors for the Control of Temperature or Humidity for any purpose and over every range used in manufacturing purposes or buildings, furnishing and installing:

Temperature Controlling Apparatus for any and all kinds of heating and ventilating systems.

Temperature Controlling Apparatus for any industrial process requiring the medium of heat.

Control of Humidity in industrial processes requiring artificial humidity.

Temperature Control of hot water tanks and all liquids.

Control of Temperatures of refrigerating and cold storage plants.

Thermostatic Control of electric motors on automatic refrigerating.

## SPECIFIC APPLICATIONS OF TEMPERATURE CONTROL

Bake ovens for enamels, japans, etc.  
Core drying ovens.  
Drying room for paint, varnish, patent leather, etc.  
Storage room for tobacco, rubber or similar goods  
Cold storage rooms, fur vaults, etc.  
Canning machinery, cookers, exhausters, processors.  
Corn and oats drying apparatus.  
Fruit drying apparatus



## JOHNSON ELECTRIC INSERTION THERMOSTAT

For insertion in brine systems of electrically driven ice machines, to regulate the temperature of brine by the control of the motor; for

ELECTRIC INSERTION THERMOSTAT

insertion through wall of refrigerator, to regulate temperature of cooled space by the control of motor; for regulation of temperature in electrically heated water system or tank, by control of heater; for regula-

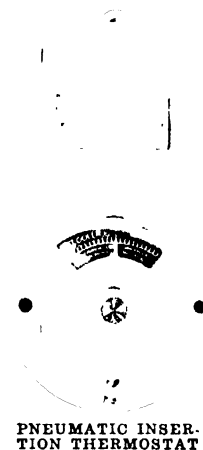
tion of temperature in electrically heated compartment, by control of the heater.

## JOHNSON PNEUMATIC INSERTION THERMOSTAT

Designed to control temperatures within closed air chambers or ducts. The body of thermostat is a dust-proof case containing the two working parts and extending outside the chamber.

This thermostat is made either positive or graduated acting.

**Applications**—Adaptable for use in bake ovens for enamels, japans, etc.; drying rooms for paints, varnishes, patent leather, etc.; storage rooms for tobacco, rubber or similar goods; sterilizers or pasteurizers; cold storage rooms, fur vaults, etc.; refrigerator machine control; humidity control for air washers; flue gas temperature control; hot blast heating plants; combination tempered ventilation and hot blast systems; greenhouses, turkish bath rooms, etc.; tempered ventilation for buildings.



PNEUMATIC INSERTION THERMOSTAT

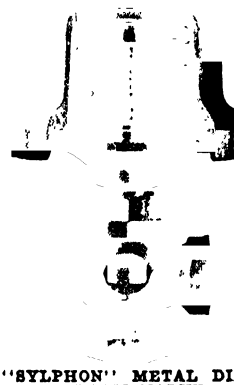
## "SYLPHON" DIAPHRAGM VALVES

The metal diaphragm in this valve is the celebrated "Sylphon" seamless bellows patented and manufactured by The Fulton Company, and the Johnson Service Company is the only company authorized to use this bellows in the diaphragm valves which they furnish with their system.

It is made in all standard sizes and shapes. All small valves have heavy brass bodies and Jenkins discs. Larger valves are of the very best gray iron casting and have Jenkins discs. The valve is adaptable for any service and is practically indestructible through use.

## SERVICE

Service means emphatically the dictionary definition.



"SYLPHON" METAL DIAPHRAGM VALVE

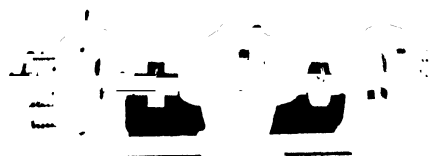


# JANTZ & LEIST ELECTRIC CO.

Manufacturers of  
Electric Motors and Generators  
WESTERN AVE. AND YORK ST., CINCINNATI, OHIO

## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	2400 3-6	1200 6-12	28		
3200 1-6	1600 6-12	50	3200 3-6	1600 6-12	40		
4000 1-6	2000 6-12	50	4000 3-6	2000 6-12	50		
5000 1-6	2500 6-12	60	5000 3-6	2500 6-12	60		
7000 3-6	3500 6-12	100	7000 3-6	3500 6-12	85		
8000 5-10	4000 10-20	150	8000 3-6	4000 6-12	100		
10000 4-8	5000 8-16	150	10000 2-8	5000 4-16	150		



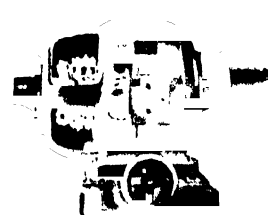
### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO. STAT

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty  
From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Dia	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	1	1	1 1/8	
	1000	5	4	1 1/8	
	210	5	4	1 1/8	
	220	6	5	1 1/8	
2 1/2	1000	5	3	1 1/8	
	475	5	4	1 1/8	
	475	5	4	1 1/8	
	750	6	6	1 1/8	
3	1350	5	1	1 1/8	
	450	6	4	1 1/8	
	430	6	4	1 1/8	
	285	7	5	1 1/8	
3 1/2	675	5	5	1 1/8	
	500	5	5	1 1/8	
4	175	8	5	1 1/8	
5	1000	5	5	1 1/8	
	750	6	5	1 1/8	
	400	8	5	1 1/8	
	400	9	6	1 1/8	
7 1/2	1800	5	4	1 1/8	
	1150	6	5	1 1/8	
	650	8	6	1 1/8	
	500	10	6	1 1/8	
	425	10	6	1 1/8	
10	1700	8	5	1 1/8	
	1000	8	5	1 1/8	
	750	8	6	1 1/8	
	600	8	6	1 1/8	
	400	10	8	1 1/8	
15	1350	7	6	1 1/8	
	1050	8	8	1 1/8	
	850	10	6	1 1/8	
	575	10	8	1 1/8	
	390	12	8	1 1/8	
20	800	10	8	1 1/8	
	525	12	8	1 1/8	
	475	16	10	2 1/8	
30	1200	10	8	1 1/8	
	1000	10	8	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H P	R. P. M.	Efficiency		
		100%	75%	50%
5	1750	85	83	78 5
	1150	86	84 1	79 4
7 1/2	1750	86 5	84 5	79 8
	1150	87	85	80
10	1750	87	85 2	80
	1150	87 2	85 3	80 5
15	1750	87 2	85 2	80 2
	1150	87 5	86	80 9
20	1750	88	86 4	80 6
	1150	88	86	81 3
25	1750	88 6	86 2	81 5
	1150	89	87 2	83
35	1750	89 3	87 8	83 3
	1150	89 7	88	84
40	1750	90	88 3	84 3
	1150	90 5	89 2	86 2
50	1750	91	89 7	89
	1150	91	89 7	87
60	1750	91 2	90	87
	1150	91 3	90	87

# JOHNSON SERVICE COMPANY

Temperature Regulation and Humidity Control

MILWAUKEE, WIS.

## BRANCHES

Boston, Mass., 41 Waldo Street  
Buffalo, N. Y., Erie County Bank Building  
Chicago, Ill., 177 North Dearborn Street  
Cincinnati, Ohio, 406 Gewyria Building  
Cleveland, Ohio, 2028 E. 2nd Street  
Denver, Colo., 517 Boston Building  
Des Moines, Iowa, 240 Masonic Temple  
Detroit, Mich., 42 Michigan Street West  
Indianapolis, Ind., 141 Pendrooke Arcade  
Kansas City, Mo., 411 East Tenth Street  
Milwaukee, Wis., 149 Michigan Street

Los Angeles, Cal., 605 Van Nuys Building  
Minneapolis, Minn., 308 Third Avenue South  
New York, N. Y., 118 East Twenty eighth Street  
Omaha, Neb., 609 Paxton Building  
Philadelphia, Pa., 1521 Sanson Street  
Pittsburgh, Pa., Century Building  
Portland, Ore., 404 Fading Building  
San Francisco, Cal., 417 Hault Building  
Seattle, Wash., 452 Colman Building  
St. Louis, Mo., 14 North Twelfth Street  
Salt Lake City, Utah, 301 Templeton Building

## CANADIAN REPRESENTATIVE

**JOHNSON TEMPERATURE REGULATING COMPANY OF CANADA, LIMITED**

## OFFICES

Calgary, Alta., 605 Second Street West  
Montreal, Que., 284 Beaver Hall Hill

Toronto, Ont., 118 Adelaide Street West  
Winnipeg, Man., 259 Stanley Street  
Vancouver, B. C., 550 Sixth Ave. W.

## PRODUCTS AND SERVICES

**Manufacturers of Thermostats and Other Apparatus for the Control of Temperature and Humidity, including:**

Thermostats and Humidostats.  
"Sylphon" Metal Diaphragm and Rubber Diaphragm Valves.  
Air and Water Reducing Valves.  
Pneumatic Switches or Push Buttons.

**Engineers and Contractors for the Control of Temperature or Humidity for any purpose and over every range used in manufacturing purposes or buildings, furnishing and installing:**

Temperature Controlling Apparatus for any and all kinds of heating and ventilating systems.

Temperature Controlling Apparatus for any industrial process requiring the medium of heat.

Control of Humidity in industrial processes requiring artificial humidity.

Temperature Control of hot water tanks and all liquids.

Control of Temperatures of refrigerating and cold storage plants.

Thermostatic Control of electric motors on automatic refrigerating.

## SPECIFIC APPLICATIONS OF TEMPERATURE CONTROL

Bake ovens for enamels, japans, etc.  
Core drying ovens.  
Drying room for paint, varnish, patent leather, etc.  
Storage room for tobacco, rubber or similar goods  
Cold storage rooms, fur vaults, etc.  
Canning machinery, cookers, exhausters, processors.  
Corn and oats drying apparatus.  
Fruit drying apparatus



## JOHNSON ELECTRIC INSERTION THERMOSTAT

For insertion in brine systems of electrically driven ice machines, to regulate the temperature of brine by the control of the motor; for

**ELECTRIC INSERTION THERMOSTAT**

insertion through wall of refrigerator, to regulate temperature of cooled space by the control of motor; for regulation of temperature in electrically heated water system or tank, by control of heater; for regula-

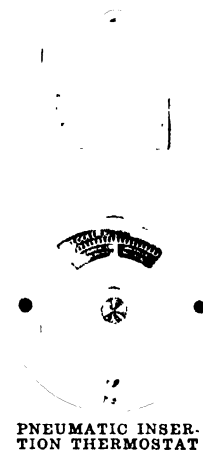
tion of temperature in electrically heated compartment, by control of the heater.

## JOHNSON PNEUMATIC INSERTION THERMOSTAT

Designed to control temperatures within closed air chambers or ducts. The body of thermostat is a dust-proof case containing the two working parts and extending outside the chamber.

This thermostat is made either positive or graduated acting.

**Applications**—Adaptable for use in bake ovens for enamels, japans, etc.; drying rooms for paints, varnishes, patent leather, etc.; storage rooms for tobacco, rubber or similar goods; sterilizers or pasteurizers; cold storage rooms, fur vaults, etc.; refrigerator machine control; humidity control for air washers; flue gas temperature control; hot blast heating plants; combination tempered ventilation and hot blast systems; greenhouses, turkish bath rooms, etc.; tempered ventilation for buildings.



**PNEUMATIC INSERTION THERMOSTAT**

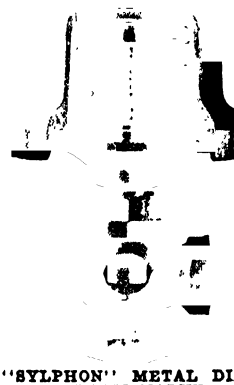
## "SYLPHON" DIAPHRAGM VALVES

The metal diaphragm in this valve is the celebrated "Sylphon" seamless bellows patented and manufactured by The Fulton Company, and the Johnson Service Company is the only company authorized to use this bellows in the diaphragm valves which they furnish with their system.

It is made in all standard sizes and shapes. All small valves have heavy brass bodies and Jenkins discs. Larger valves are of the very best gray iron casting and have Jenkins discs. The valve is adaptable for any service and is practically indestructible through use.

## SERVICE

Service means emphatically the dictionary definition.



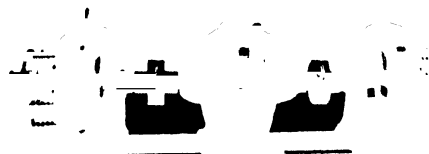
**"SYLPHON" METAL DIAPHRAGM VALVE**

# JANTZ & LEIST ELECTRIC CO.

Manufacturers of  
Electric Motors and Generators  
WESTERN AVE. AND YORK ST., CINCINNATI, OHIO

## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.

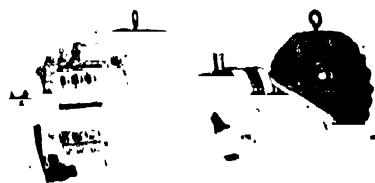


### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	2400 3-6	1200 6-12	28		
3200 1-6	1600 6-12	50	3200 3-6	1600 6-12	40		
4000 1-6	2000 6-12	50	4000 3-6	2000 6-12	50		
5000 1-6	2500 6-12	60	5000 3-6	2500 6-12	60		
7000 3-6	3500 6-12	100	7000 3-6	3500 6-12	85		
8000 5-10	4000 10-20	150	8000 3-6	4000 6-12	100		
10000 4-8	5000 8-16	150	10000 2-8	5000 4-16	150		



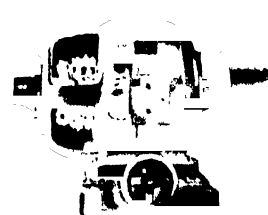
### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO. STAT

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty  
From 1 H. P. to 100 H. P.

H P	R P M	Standard Pulley			
		Di	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	1	1	1 1/8	
	1000	5	4	1 1/8	
	210	5	4	1 1/8	
	220	6	5	1 1/8	
2 1/2	1000	5	3	1 1/8	
	475	5	4	1 1/8	
	475	5	4	1 1/8	
	750	6	6	1 1/8	
3	1350	5	3	1 1/8	
	450	6	4	1 1/8	
	430	6	4	1 1/8	
	285	7	5	1 1/8	
3 1/2	675	5	5	1 1/8	
	500	5	5	1 1/8	
4	175	8	5	1 1/8	
5	1000	5	5	1 1/8	
	750	6	5	1 1/8	
	400	8	5	1 1/8	
	400	9	6	1 1/8	
7 1/2	1800	5	4	1 1/8	
	1150	6	5	1 1/8	
	650	8	6	1 1/8	
	500	10	6	1 1/8	
	425	10	6	1 1/8	
10	1700	8	5	1 1/8	
	1000	8	5	1 1/8	
	750	8	6	1 1/8	
	600	8	6	1 1/8	
	400	10	8	1 1/8	
15	1350	7	6	1 1/8	
	1050	8	8	1 1/8	
	850	10	6	1 1/8	
	575	10	8	1 1/8	
	390	12	8	1 1/8	
20	800	10	8	1 1/8	
	525	12	8	1 1/8	
	475	16	10	2 1/8	
30	1200	10	8	1 1/8	
	1000	10	8	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H. P. to 15 H. P.

H. P.	R. P. M.	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7 1/2	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.4	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91	89.7	89
	1150	91.2	90	87
60	1750	91.3	90	87

# E. KEELER COMPANY

Established 1864

Boilers and Steel Plate Work  
WILLIAMSPORT, PA.

New York

Buffalo

Boston

Philadelphia  
Portland, Ore

Pittsburgh

Cleveland

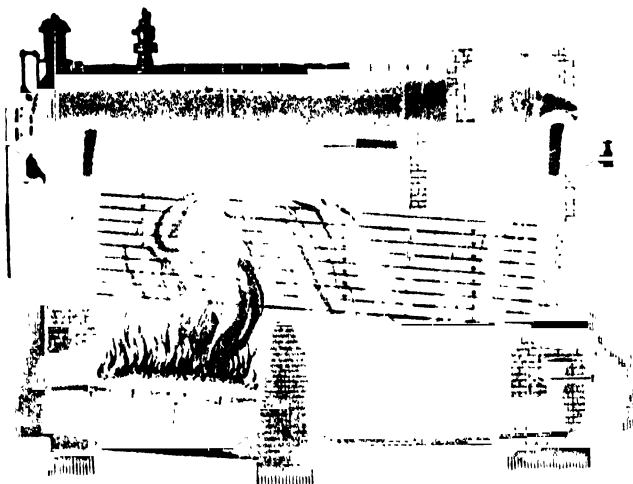
Chicago

## PRODUCTS

Manufacturers of Water Tube and Tubular Boilers  
Steel Plate Work

### KEELER WATER TUBE BOILERS

**Standard Type**—The arrangement of furnace, tubes, headers and drum in the Keeler Water Tube Boiler is efficient, accessible and compact. The superior efficiency of the Keeler Boiler rests upon correct proportions of heating and grate surface for the character of fuel to be burned, ample height of furnace, a superior arrangement of baffle walls and a perfect circulation. Every portion of the heating surface is accessible for both external and internal inspection, making it impossible for soot or scale to accumulate undetected. There is ample room between tubes and drum for inspection or repairs. Special patented side cleaning doors make it possible to observe the condition of the outside surface of the tubes. There is no part of the interior surface that cannot be examined and cleaned.

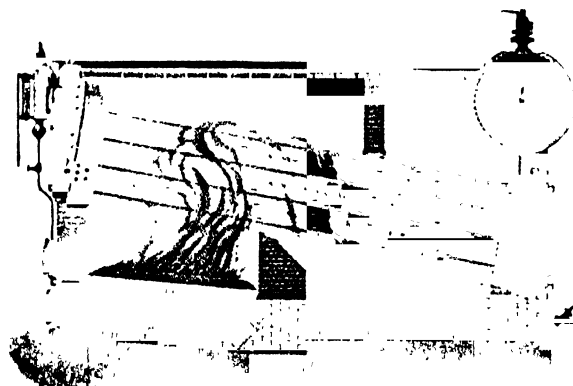


STANDARD TYPE WATER TUBE BOILER

Keeler Water Tube Boilers are usually built complete and tested in the shop. This reduces the cost of erection, as the boilers are handled as a unit. It also eliminates the dangers due to careless assembling of boilers in the field and makes the erection merely a matter of placing in position and attaching fittings.

Built in units 75 to 1500 H. P.

**Cross Drum Type**—The Keeler Cross Drum Water Tube Boiler is a modification of the standard design, only in the length and location of the drum and the method of connecting it to the headers. This type was developed to meet the demand for a high pressure water tube boiler that could be installed in Office Buildings, School Houses, Churches, Apartment Houses, Hotels and boiler rooms generally where ceiling height is limited or where the boiler must be introduced through narrow passageway or restricted openings.



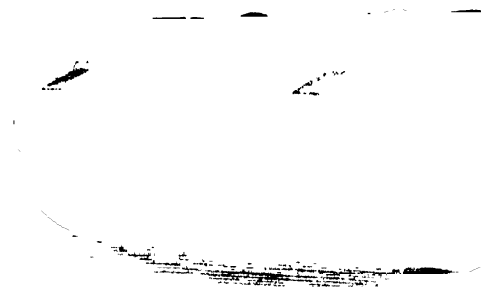
CROSS DRUM TYPE WATER TUBE BOILER

The pressure parts of the boiler are shipped in a knocked-down condition, making it possible to install it without cutting through walls and floors in locations that would be wholly inaccessible for almost any other type of boiler. If boilers are to be exported, the cross drum boiler can be handled at much less expense by steamship companies on account of its reduced bulk in a knocked-down condition, and the comparatively small weight of the heaviest piece.

Built in units 60 to 1000 H. P.

### KEELER HORIZONTAL RETURN TUBULAR BOILERS

Our Return Tubular Boiler is the product of fifty-seven years' experience of boiler building. Tube holes are drilled from the solid plate, and not punched small and reamed to size. All seams are thoroughly caulked on the outside, and the end of butt straps are caulked on the inside. Braces are drop-forged.



HORIZONTAL RETURN TUBULAR BOILER

Steam and safety valve outlets are provided with wrought steel connections of an approved type. Man-hole plates, yokes and brackets are of pressed steel. All boilers built to A. S. M. E. requirements.

**FIFTY-SEVEN YEARS OF BOILER BUILDING**

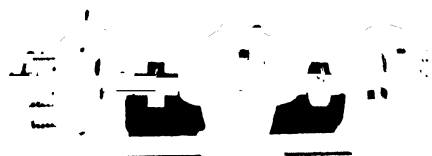
Ask for Catalogs.

# JANTZ & LEIST ELECTRIC CO.

Manufacturers of  
Electric Motors and Generators  
WESTERN AVE. AND YORK ST., CINCINNATI, OHIO

## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.

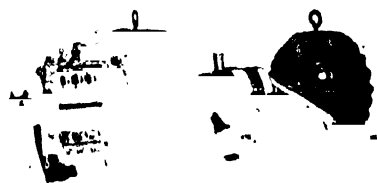


### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	2400 3-6	1200 6-12	28		
3200 1-6	1600 6-12	50	3200 3-6	1600 6-12	40		
4000 1-6	2000 6-12	50	4000 3-6	2000 6-12	50		
5000 1-6	2500 6-12	60	5000 3-6	2500 6-12	60		
7000 3-6	3500 6-12	100	7000 3-6	3500 6-12	85		
8000 5-10	4000 10-20	150	8000 3-6	4000 6-12	100		
10000 4-8	5000 8-16	150	10000 2-8	5000 4-16	150		



### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO.

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty  
From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Di	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	1	1	1 1/8	
	1000	5	4	1 1/8	
	210	5	4	1 1/8	
	220	6	5	1 1/8	
2 1/2	1000	5	3	1 1/8	
	475	5	4	1 1/8	
	475	5	4	1 1/8	
	750	6	6	1 1/8	
3	1350	5	3	1 1/8	
	450	6	4	1 1/8	
	430	6	4	1 1/8	
	285	7	5	1 1/8	
3 1/2	675	5	5	1 1/8	
	500	5	5	1 1/8	
4	175	8	5	1 1/8	
5	1000	5	5	1 1/8	
	750	6	5	1 1/8	
	400	8	5	1 1/8	
	400	9	6	1 1/8	
7 1/2	1800	5	4	1 1/8	
	1150	6	5	1 1/8	
	650	8	6	1 1/8	
	500	10	6	1 1/8	
	425	10	6	1 1/8	
10	1700	8	5	1 1/8	
	1000	8	5	1 1/8	
	750	8	6	1 1/8	
	600	8	6	1 1/8	
	400	10	8	1 1/8	
15	1350	7	6	1 1/8	
	1050	8	8	1 1/8	
	850	10	6	1 1/8	
	575	10	8	1 1/8	
	390	12	8	1 1/8	
20	800	10	8	1 1/8	
	525	12	8	1 1/8	
	475	16	10	2 1/8	
30	1200	10	8	1 1/8	
	1000	10	8	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H P	R. P. M.	Efficiency			
		100%	75%	50%	
5	1750	85	83	78	5
	1150	86	84	79	4
7 1/2	1750	86	84	79	8
	1150	87	85	80	
10	1750	87	85	80	
	1150	87	85	80	5
15	1750	87	85	80	2
	1150	87	85	80	9
20	1750	88	86	80	6
	1150	88	86	81	3
25	1750	88	86	81	5
	1150	89	87	82	
35	1750	89	87	83	3
	1150	89	87	84	
40	1750	90	88	84	3
	1150	90	89	86	2
50	1750	91	89	87	
	1150	91	89	87	
60	1750	91	90	87	
	1150	91	90	87	

# THE M. W. KELLOGG COMPANY

Kellogg Forge-Welded Equipment (Chemi-Steel)

90 West Street

NEW YORK, N. Y.

Cable Address  
MONOLOGO, New York

## PRODUCTS

Acid Eggs  
 Autoclaves  
 Gray Iron Castings  
 Chlorine Containers  
 Barometric Condensers  
 Cyanide Pots  
 Pulp Digesters  
 Rotary Dryers  
 Grease Kettles  
 Caustic Kettles  
 Mixers, Forge Welded  
 Nitrators  
 Niter Pots  
 Pans, Forge Welded  
 Pots, All Kinds  
 Reducers  
 Retorts  
 Acid Stills  
 Oil Still, High Pressure  
 Sulphonators  
 Tanks, Forge Welded  
 Tanks, Tank Car  
 Vacuum Pans  
 Washers, Acid, Benzol, etc.  
 Steam Separators  
 Steam Plant Specialties  
 Power Piping  
 Sugar Mill Piping  
 Chimneys  
 Piping Contractors  
 Fittings  
 Penstocks, High Head, Forge Welded  
 Paper and Pulp Mill Equipment  
 Petroleum Refineries, Complete  
 Vulcanizers  
 Experimental Equipment, Forged Steel

## "CHEMI-STEEL"

The advantages of Chemical Equipment constructed of acid resistant steel instead of brittle cast iron are obvious. Nitrators and Sulphonators can be water or steam jacketed with entire safety due to the elimination of cast iron in their construction. Autoclaves can be used at pressures and for corrosive materials heretofore unthought of.

The M. W. Kellogg Company has, after many years of investigation, developed "Chemi-Steel," a mild steel of special analysis which has much greater acid resistant properties than the highest quality gray cast iron.

"Chemi-Steel" is used in all Kellogg Forge-Welded Equipment as its high tensile strength and unusually high elastic limit make it readily adaptable for all classes of work.

The brochure, "Corrosion Tests on Chemi-Steel," will gladly be sent you for your inspection.

## KELLOGG FORGE-WELDED EQUIPMENT

No matter how resistant the construction material may be to the action of reagents, it is often rendered valueless by the method of fabrication.

Riveted joints cannot be made tight. The rivets become loosened from expansion and contraction due to change in pressure or temperature. Even at the best, there is always a gasket of iron oxide between the plates and around the rivets which is easily attacked by acids and alkalis.

The upper photomicrograph is of a riveted joint (50 Diameters). Note the gasket of iron oxide between the two plates. This is readily attacked by acids or alkalis and is one of the most frequent causes of breakdown of the riveted joint.

The middle photograph (50 Diameters) is of an electric weld and shows plainly the coarse crystalline structure. Such a structure readily breaks down under variable stresses due to "metal fatigue." In addition, it is open to attack by reagents.

The lower photograph (50 Diameters) is of a Kellogg Forge-Welded Joint and illustrates the perfect homogeneity of the joint. In fact, a careful microscopic examination discloses the fact that there is no joint, but a true seamless construction.

Electric or Autogenous welding, on account of rapid cooling from high temperatures, has a coarse crystal-



MICROPHOTO-  
GRAPHS OF JOINTS

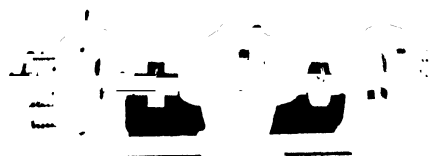
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# JANTZ & LEIST ELECTRIC CO.

Manufacturers of  
Electric Motors and Generators  
WESTERN AVE. AND YORK ST., CINCINNATI, OHIO

## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	2400 3-6	1200 6-12	28		
3200 1-6	1600 6-12	50	3200 3-6	1600 6-12	40		
4000 1-6	2000 6-12	50	4000 3-6	2000 6-12	50		
5000 1-6	2500 6-12	60	5000 3-6	2500 6-12	60		
7000 3-6	3500 6-12	100	7000 3-6	3500 6-12	85		
8000 5-10	4000 10-20	150	8000 3-6	4000 6-12	100		
10000 4-8	5000 8-16	150	10000 2-8	5000 4-16	150		



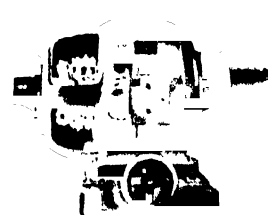
### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO. STAT

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty  
From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Di	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	1	1	1 1/8	
	1000	5	4	1 1/8	
	210	5	4	1 1/8	
	220	6	5	1 1/8	
2 1/2	1000	5	3	1 1/8	
	475	5	4	1 1/8	
	475	5	4	1 1/8	
	750	6	6	1 1/8	
3	1350	5	3	1 1/8	
	450	6	4	1 1/8	
	430	6	4	1 1/8	
	285	7	5	1 1/8	
3 1/2	675	5	5	1 1/8	
	500	5	5	1 1/8	
4	175	8	5	1 1/8	
5	1000	5	5	1 1/8	
	750	6	5	1 1/8	
	400	8	5	1 1/8	
	400	9	6	1 1/8	
7 1/2	1800	5	4	1 1/8	
	1150	6	5	1 1/8	
	650	8	6	1 1/8	
	500	10	6	1 1/8	
	425	10	6	1 1/8	
10	1700	8	5	1 1/8	
	1000	8	5	1 1/8	
	750	8	6	1 1/8	
	600	8	6	1 1/8	
	400	10	8	1 1/8	
15	1350	7	6	1 1/8	
	1050	8	8	1 1/8	
	850	10	6	1 1/8	
	575	10	8	1 1/8	
	390	12	8	1 1/8	
20	800	10	8	1 1/8	
	525	12	8	1 1/8	
	475	16	10	2 1/8	
30	1200	10	8	1 1/8	
	1000	10	8	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H. P.	R. P. M.	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7 1/2	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.4	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91	89.7	89
	1150	91.2	90	87
60	1750	91.3	90	87

# THE KELLY & JONES COMPANY

## Chemical Engineering Equipment, Brass, Iron and Steel Valves, Fittings and Cocks

WORKS  
GREENSBURG, PA.

### OFFICES

NEW YORK, 2509-10-11 Park Row Building  
PITTSBURGH, 131-37 Water Street  
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ST. LOUIS, 705 Laclede Gas Building  
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BUFFALO, 572 Ellicott Square

### PRODUCTS

A complete line of Valves, Pipe Fittings and Specialties for the Chemical Industry including Cast Iron, Malleable, Brass and Steel Fittings; Brass, Iron and Steel Valves and Cocks; Wrought Pipe and Nipples; Engine and Boiler Trimmings; Expansion Joints; Specialties, Etc., for Acid, Alkalies, Ammonia, Benzol, Steam, Gas, Water, Air and Oil.

### CO-OPERATIVE SERVICE

We gladly offer the services of our engineers to the engineers using this catalogue, if in any way, by advice or suggestion, we could be of service to them.

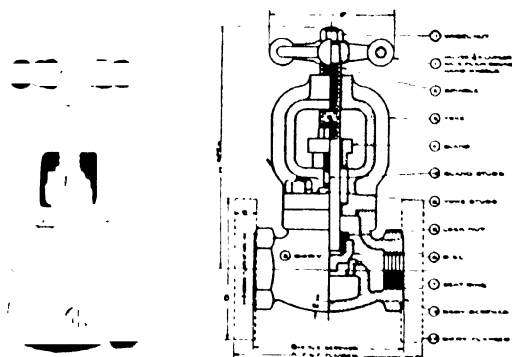


### TESTS

Our chemists make daily tests of all raw material entering into the manufacture of our goods. All work is carefully tested and inspected throughout the process of manufacture and after completion, thus insuring a finished product that is as near perfection as it is possible to make.

### ACID GLOBE VALVE

This acid globe valve is a heavy, well made valve and was designed especially for the Chemical trade. Can be furnished in either all Iron or all Steel and all the parts, including the seats and discs, are renewable. In opening this valve the spindles are screwed out of the body, free of the acid, through the yoke.



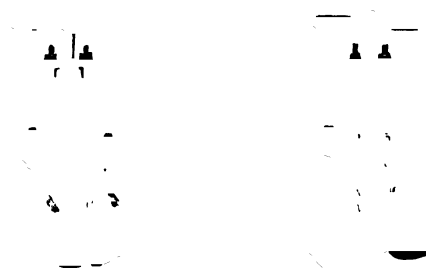
ACID GLOBE VALVE SECTIONAL DETAIL ACID GLOBE VALVE

Made in all sizes from  $\frac{1}{2}$ " to 4" screwed or flanged  $1\frac{1}{4}$ " and larger furnished with a plain round hand wheel and the smaller sizes with the Ball Pattern Wheel.

Separate parts for this valve can be ordered by specifying the part numbers shown in the sectional.

### ALL IRON STRAIGHTWAY VALVES

These all iron valves are specially adapted for service where temperature exceeds 325° F. and for handling cyanides, acids and other solutions, which are injurious to brass.



SCREWED

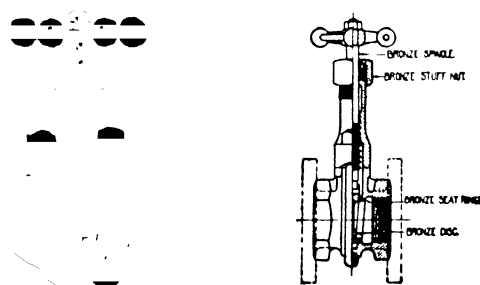
FLANGED

The guides on the discs and ribs in the body are so constructed as to insure an easy movement of the disc and eliminate all possible danger of the disc coming in contact with the seat, except at the point of closing.

We also make a complete line of Iron Body Brass Mounted and Steel Straightway Valves for all pressures and purposes.

### SADDLE TYPE STRAIGHTWAY VALVES

This saddle style is a very durable and compact valve and economical owing to the simplicity of construction. The Steel saddle around the body of the valve holds the Bonnet securely in place and can be easily removed, permitting of access to the interior of valve for cleaning and repair purposes.



SADDLE VALVE

SECTIONAL VIEW SADDLE VALVE

Can be furnished either black or red japanned in all iron body brass mounted. The all-iron style is highly recommended for use in connection with Cyanide, Benzol, Creosote, etc. Recommended for 125 pounds working pressure.

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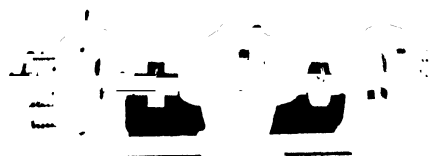


# JANTZ & LEIST ELECTRIC CO.

Manufacturers of  
Electric Motors and Generators  
WESTERN AVE. AND YORK ST., CINCINNATI, OHIO

## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.



### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	35	2400 3-6	1200 6-12	28	28
3200 1-6	1600 6-12	50	50	3200 3-6	1600 6-12	40	40
4000 1-6	2000 6-12	50	50	4000 3-6	2000 6-12	50	50
5000 1-6	2500 6-12	60	60	5000 3-6	2500 6-12	60	60
7000 3-6	3500 6-12	100	100	7000 3-6	3500 6-12	85	85
8000 5-10	4000 10-20	150	150	8000 3-6	4000 6-12	100	100
10000 4-8	5000 8-16	150	150	10000 2-8	5000 4-16	150	150



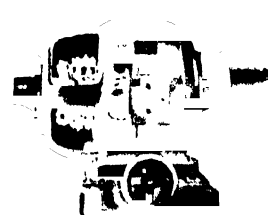
### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO. STAT

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Dia	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	4	1	1 1/8	
	1000	5	1	1 1/8	
	210	5	1	1 1/8	
	220	6	1	1 1/8	
2 1/2	1000	5	1	1 1/8	
	475	5	1	1 1/8	
	475	5	1	1 1/8	
	750	6	1	1 1/8	
3	1350	5	1	1 1/8	
	450	6	1	1 1/8	
	430	6	1	1 1/8	
	285	7	1	1 1/8	
3 1/2	675	5	1	1 1/8	
	500	5	1	1 1/8	
4	135	8	1	1 1/8	
5	1000	5	1	1 1/8	
	750	6	1	1 1/8	
	400	8	1	1 1/8	
	400	9	1	1 1/8	
7 1/2	1800	5	1	1 1/8	
	1150	6	1	1 1/8	
	650	8	1	1 1/8	
	500	10	1	1 1/8	
	425	10	1	1 1/8	
10	1700	8	1	1 1/8	
	1000	8	1	1 1/8	
	750	8	1	1 1/8	
	600	8	1	1 1/8	
	400	10	1	1 1/8	
15	1350	7	1	1 1/8	
	1050	8	1	1 1/8	
	850	10	1	1 1/8	
	575	10	1	1 1/8	
	390	12	1	1 1/8	
20	800	10	1	1 1/8	
	525	12	1	1 1/8	
	475	16	1	1 1/8	
30	1200	10	1	1 1/8	
	1000	10	1	1 1/8	
	750	12	1	1 1/8	
35	850	12	1	1 1/8	
	675	12	1	1 1/8	
40	575	14	1	1 1/8	
50	675	14	1	1 1/8	
60	1000	14	1	1 1/8	
	435	20	1	1 1/8	
75	575	20	1	1 1/8	
100	800	20	1	1 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H P	R. P. M.	Efficiency			
		100%	75%	50%	
5	1750	85	83	78	5
	1150	86	84	79	4
7 1/2	1750	86	84	79	8
	1150	87	85	80	
10	1750	87	85	80	
	1150	87	85	80	5
15	1750	87	85	80	2
	1150	87	85	80	9
20	1750	88	86	80	6
	1150	88	86	81	3
25	1750	88	86	81	5
	1150	89	87	82	
35	1750	89	87	83	3
	1150	89	87	84	
40	1750	90	88	84	3
	1150	90	89	86	2
50	1750	91	89	87	
	1150	91	89	87	
60	1750	91	90	87	
	1150	91	90	87	

# THE C. M. KEMP MANUFACTURING CO.

Manufacturers of

## Kemp Automatic Gas System

405-417 EAST OLIVER STREET, BALTIMORE, MD.

### PRODUCTS

Kemp Automatic Gas System and Specially designed Burners for all Industrial uses.

### SERVICES

We have engineers at your service to consult with you on your gas heating problems. We have the facilities for designing and building our gas system to meet the most rigid specifications.

### THE KEMP AUTOMATIC GAS SYSTEM

Is an improved method of utilizing municipal gas, whether manufactured or natural, for factory fuel purposes, for all mechanical processes and operations in which uniformity of pressure, temperature control, safety, reliability and economy in application of fuel are factors. It is the most modern and efficient means of applying gaseous fuel to furnaces, retorts, crucibles, ovens, etc., and for soldering, brazing, tempering, welding, chemical laboratory work, as well as producing intense illumination with incandescent burners. By the Kemp System actual savings in gas consumption of from 25 per cent to 75 per cent are made.

Municipal or producer gas and air are automatically mixed in predetermined ratio, in exact amount to supply the current demand, and are compressed to pressure of from one to three pounds per square inch, depending upon the character of work to be performed.

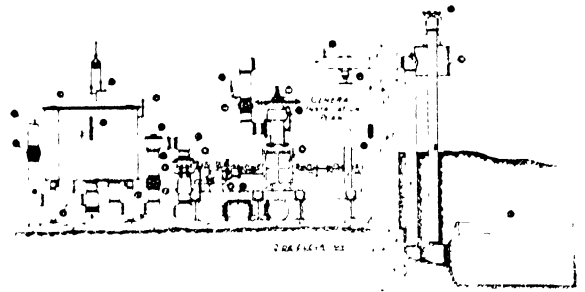
The ratio of air and gas can be instantly changed at will. For most mechanical purposes the mixture is delivered to the burners under pressure of one pound. No air is mixed at the burner. All the mixing is done in the machine. The intensity of the heat is adjusted by one valve, which controls the flow of gas to the burner.

Machine can be located in basement or on any floor of the building. Occupies little floor space or can be suspended from ceiling. Requires no more power than the ordinary fan or blower.

No matter how large or small your gas consumption, it may be greatly to your interest to communicate with us.

### GENERAL INSTALLATION PLAN

The General Installation Plan of the Kemp System shows the parts located inside and those outside the building. The machine proper consists of a water seal gas receiver "B" resting on a metal stand to which the gas from the meter is fed through the pipe "A." This receiver serves as a reservoir and a pressure governor. Whether the incoming gas is at a pressure of two or three inches water column or six to eight ounces, it is reduced by this receiver to one and half inch water column and at this pressure is fed through the pipe "H" and the check valve "C" to the apparatus proper. The cut shows but one side of the machine. Directly opposite the valve "C" there is another valve which controls the air inlet. These valves are mounted



GENERAL INSTALLATION PLAN OF A KEMP GAS SYSTEM

on the top of an inlet chamber on which is also mounted double port slide valves similar in construction to those of a steam engine. These valves are operated in unison. They are of the same area but the proportion of air and gas is affected by timing them. For instance, if five parts of air and one part of gas are wanted, the roller is placed in such position on the cam drum that the air valve is held open five times as long as the gas valve. Air and gas are drawn in alternately passing through the check valve "J" and into the gas pump "K" at the bottom. They are compressed and discharged from the top of the pump. The pressure of the discharged air and gas mixture is controlled by the diaphragm valve "W." On the opposite side of the gas pump is a bypass valve through which a portion of the air and gas mixture is returning to the inlet side of the pump. The pump is always compressing a greater volume than is required and there is a portion of the mixture in circulation. This assures even pressure and complete mixing. The gas and air mixture then passes through the pipe "N" to the outside of the building where it goes into the expansion tank "U." From this tank it passes through the check valve "O," back fire preventor "R" and into the burners. The apparatus operates at a constant speed whether one or many burners are in operation; is set to produce the desired quality of mixture by placing the roller on such position of the cam drum as to give the desired ratio of air and gas. This roller can be changed at will without interruption to the service, but when once adjusted, the same quality of mixture is maintained whether many or few burners are in operation. Machine requires no attention other than an oiling once a day. So accurately does it proportion the air and gas that a neutral furnace atmosphere can be produced and maintained almost indefinitely or until the quality of the incoming gas varies sufficiently to alter the character of mixture set up by the apparatus. The ratio of air and gas delivered by our machine will not vary unless manually changed.

### CAPACITIES

The Kemp System is made in sizes of from 300 cubic feet per hour to 10,000 cubic feet per hour, and can be installed in batteries of as many of the large size as are necessary. In stating capacities of machines in

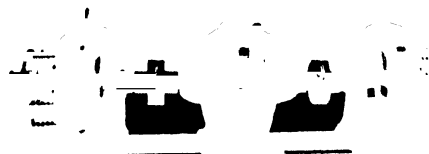
*Continued on Next Page*

# JANTZ & LEIST ELECTRIC CO.

Manufacturers of  
Electric Motors and Generators  
WESTERN AVE. AND YORK ST., CINCINNATI, OHIO

## PRODUCTS

Low Voltage Generators for Electrolytic Work, Electroplating, Electro-Cleaning or General Deposition of Metals or Special Chemical Work in sizes from 150 amperes up to 10,000 amperes capacity, either belt or motor driven. Motor can be alternating or direct current.

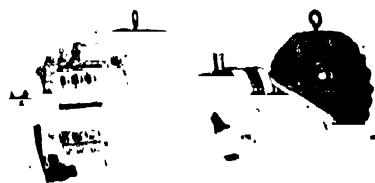


### MOTOR GENERATOR SET FOR 3-WIRE DISTRIBUTION

**A C Set** Consists of two direct current generators and one alternating current motor, motor either 2 or 3 phase 220 or 440 volts, 60 cycle, with shunt field rheostat for each generator and compensator for motor. Generators and motor mounted on substantial base rails, with exciter attached.

**D C Set** Consists of two direct current low voltage generators and one direct current motor, motor either 115, 240 or 550 volts. Shunt rheostat for each generator and "no voltage" automatic release starter for the motor. Generators and motors mounted on substantial iron base rails.

Operation A C				Operation D C			
Parallel	Series	Motor H P	Volts	Parallel	Series	Motor H P	Volts
2400 1-6	1200 6-12	35	2400 3-6	1200 6-12	28		
3200 1-6	1600 6-12	50	3200 3-6	1600 6-12	40		
4000 1-6	2000 6-12	50	4000 3-6	2000 6-12	50		
5000 1-6	2500 6-12	60	5000 3-6	2500 6-12	60		
7000 3-6	3500 6-12	100	7000 3-6	3500 6-12	85		
8000 5-10	4000 10-20	150	8000 3-6	4000 6-12	100		
10000 4-8	5000 8-16	150	10000 2-8	5000 4-16	150		



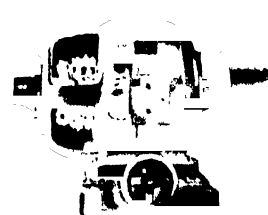
### ALTERNATING CURRENT MOTOR GENERATOR SET

Consists of direct current generator and alternating current motor, 220 or 440 volts, 2 or 3 phase, 60 cycle with Exciter attached. With each generator we furnish a shunt rheostat, with the larger motors a compensator.



### DIRECT CURRENT MOTOR GENERATOR SET

Consists of direct current motor and direct current generator. Motors standard voltages, either 110 to 125 or 220 to 250 volts. Shunt rheostat for generator and "no voltage" automatic release starting rheostat for motor.



### DIRECT CURRENT BELT-DRIVEN TYPE LOW VOLTAGE GENERATORS WITH SHUNT RHEO.

Amperes	Volts	R P M
175	2-5	900
	1-7	1200
400	2-5	720
	1-8	1200
600	2-6	720
	1-8	900
800	2-6	720
	1-8	900
1200	2-6	600
	1-8	720
1600	2-6	550
	1-8	600
	5-10	720
	6-12	800
2000	2-6	550
	1-8	600
	5-10	720
	6-12	800
2500	3-6	475
	1-8	500
	5-10	600
	6-12	720
3500	1-6	425
	1-8	475
	5-10	500
	6-12	575
4000	2-10	500
5000	3-8	450

### 115-230 VOLT TYPE I DIRECT CURRENT CONSTANT SPEED MOTORS

For Continuous Duty From 1 H P. to 100 H P.

H P	R P M	Standard Pulley			
		Dia	Face	Bore	
1	150	4	1	1 1/8	
	240	5	1	1 1/8	
2	875	4	1	1 1/8	
	1000	5	1	1 1/8	
	240	5	1	1 1/8	
	220	6	1	1 1/8	
2 1/2	1000	5	1	1 1/8	
	475	5	1	1 1/8	
	475	5	1	1 1/8	
	250	6	1	1 1/8	
3	1350	5	1	1 1/8	
	450	6	1	1 1/8	
	430	6	1	1 1/8	
	285	7	1	1 1/8	
3 1/2	675	5	1	1 1/8	
	500	5	1	1 1/8	
4	135	8	1	1 1/8	
5	1000	5	1	1 1/8	
	750	6	1	1 1/8	
	400	8	1	1 1/8	
	400	9	1	1 1/8	
7 1/2	1800	5	1	1 1/8	
	1150	6	1	1 1/8	
	650	8	1	1 1/8	
	500	10	1	1 1/8	
	425	10	1	1 1/8	
10	1700	8	1	1 1/8	
	1000	8	1	1 1/8	
	750	8	1	1 1/8	
	600	8	1	1 1/8	
	400	10	1	1 1/8	
15	1350	7	1	1 1/8	
	1050	8	1	1 1/8	
	850	10	1	1 1/8	
	575	10	1	1 1/8	
	390	12	1	1 1/8	
20	800	10	1	1 1/8	
	525	12	1	1 1/8	
	475	16	10	2 1/8	
30	1200	10	1	1 1/8	
	1000	10	1	1 1/8	
	750	12	8	2 1/8	
35	850	12	10	2 1/8	
	675	12	10	2 1/8	
40	575	14	10	2 1/8	
50	675	14	12	2 1/8	
60	1000	14	12	2 1/8	
	435	20	16	2 1/8	
75	575	20	16	2 1/8	
100	800	20	18	2 1/8	

### DATA MOTOR GENERATOR SETS

Amps	Volts	A C Set		D C Set	
		Motor H P	R P M	Motor H P	R P M
175	2-5	2	900	2	850
	3-7	3	1200	3	1200
400	2-5	5	900	5	900
	1-8	7 1/2	1200	7 1/2	1200
600	2-6	7 1/2	720	7 1/2	720
	1-8	10	900	10	900
800	2-6	10	720	10	720
	1-8	15	900	15	900
1200	2-6	15	600	15	600
	1-8	20	720	20	720
1600	2-6	20	600	20	600
	1-8	25	600	25	600
	5-10	25	720	35	720
	6-12	50	720	40	720
2000	2-6	25	600	25	600
	1-8	35	600	30	600
	5-10	35	720	40	720
	6-12	50	720	50	720
2500	3-6	35	600	30	600
	1-8	50	600	40	600
	5-10	35	720	50	720
	6-12	50	720	60	720
3500	3-6	50	600	40	500
	1-8	50	514	55	500
	5-10	75	514	70	500
	6-12	75	514	80	500
4000	2-10	75	514	75	500
5000	3-8	75	450	75	450

### 115-230 VOLT HIGH SPEED SHUNT WOUND COMMUTATING POLE MOTORS

For Pump Service Without Base or Pulley From 5 H P. to 15 H P.

H P	R. P. M.	Efficiency		
		100%	75%	50%
5	1750	85	83	78.5
	1150	86	84.1	79.4
7 1/2	1750	86.5	84.5	79.8
	1150	87	85	80
10	1750	87	85.2	80
	1150	87.2	85.3	80.5
15	1750	87.2	85.2	80.2
	1150	87.5	86	80.9
20	1750	88	86.4	80.6
	1150	88	86	81.3
25	1750	88.6	86.2	81.5
	1150	89	87.2	83
35	1750	89.3	87.8	83.3
	1150	89.7	88	84
40	1750	90	88.3	84.3
	1150	90.5	89.2	86.2
50	1750	91	89.7	89
	1150	91.2	90	87
60	1750	91.3	90	87



# THE KENNEDY VALVE MFG. CO.

MAIN OFFICE AND WORKS

ELMIRA, N. Y.

BRANCHES AND WAREHOUSES

New York, 95 John St

San Francisco, 24 25 Minna St

Boston, 47 India St

Chicago, 204 & N. Jefferson St

Philadelphia, Continental Hotel Bldg  
Seattle, L. C. Smith Bldg

Salt Lake City, Dooly Bldg  
Portland, Ore, Railway Exchange Bldg

Kansas City, Mutual Bldg  
Winnipeg, Chamber of Commerce Bldg

El Paso, Two Republics Bldg

EXPORT OFFICE 95 JOHN STREET, NEW YORK



## PRODUCTS

Gate, Globe, Angle, Check and other Valves for handling acid and alkaline chemicals, steam, water, air, gas, oil, etc. Fire hydrants, water gates, sprinkler valves for fire protection in industrial plants.

## GUARANTEE

All Kennedy goods are thoroughly tested before leaving the works. Should any defects develop from proper use of goods in the service for which they are manufactured and sold, such goods will be replaced.

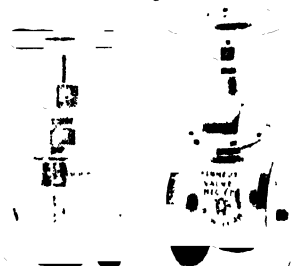


Fig. 27—Screwed  
"Standard"



Fig. 30—Flanged  
"Standard"



Fig. 37—Screwed  
"Medium Heavy"



Fig. 40—Screwed  
"Extra Heavy"



Fig. 36—Quick  
Opening



Fig. 29—Hose  
Gate



Fig. 130—Regrounding  
Globe

### BRONZE GATE VALVES



Fig. 91—Renewable  
Disc



Fig. 100—Screwed  
"Heavy"



Fig. 102—Flanged  
"Heavy" Angle



Fig. 82—Screwed  
"Standard"

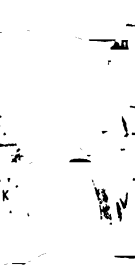


Fig. 83—Flanged  
"Standard"



Fig. 56—Bell End  
"Standard"

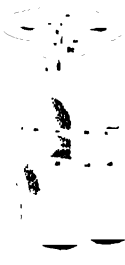


Fig. 76—Flanged  
"Extra Heavy"

### IRON-BODY BRONZE-MOUNTED GLOBE AND ANGLE VALVES

### IRON-BODY BRONZE-MOUNTED GATE VALVES



Fig. 60—Screwed  
"Standard"

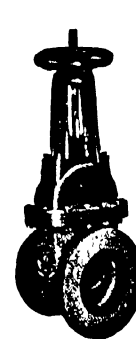


Fig. 61—Flanged  
"Standard"



Fig. 48—Flanged  
"Low Pressure"

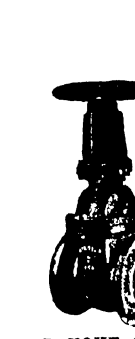


Fig. 68—Underwriters  
Approved



Fig. 75E—Flanged  
"Medium Heavy"



Fig. 771E—Flanged  
"Extra Heavy"



Fig. 47—"Low  
Pressure"

### OUTSIDE-RISING STEM AND YOKE GATE VALVES



Fig. 103—Screwed  
Swing Check



Fig. 107—Bell-End  
Check



PENNIE BACKWATER  
VALVE  
Fig. 55

### CHECK VALVES

### PENNIE BACKWATER VALVE

## WORKMANSHIP AND MATERIALS

All goods are made by expert workmen, by means of modern appliances in every department. All parts of valves are standardized and interchangeable, and every valve is thoroughly tested before shipment. All raw materials and castings produced are analyzed and tested daily during process of manufacture.

## CATALOGS

Complete catalogs in either large or pocket size will be sent on application.

# KENT MACHINE WORKS, INC.

37 to 41 Gold Street, 254 and 256 Plymouth Street  
BROOKLYN, N. Y.

## PRODUCTS

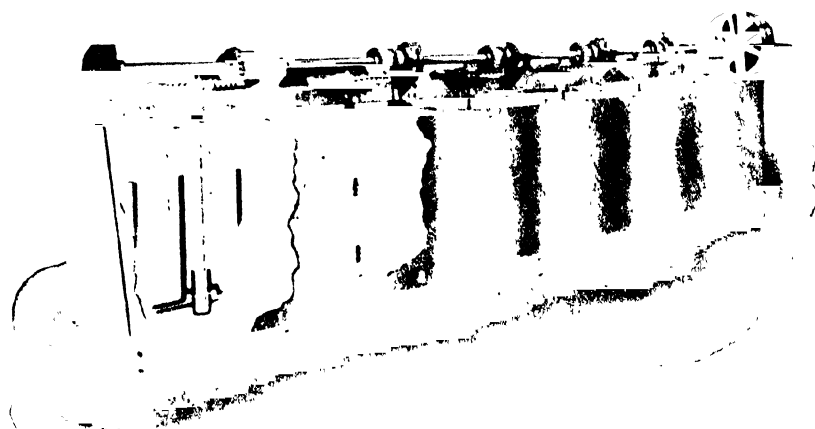
Roller Mills  
Lead Mills  
Lead Mixers  
Color Mixers  
Dry Mills  
Pulverizers  
Liquid Mixers  
Liquid Mills

## SCOPE

We manufacture a full line of machinery for the paint and ink industries

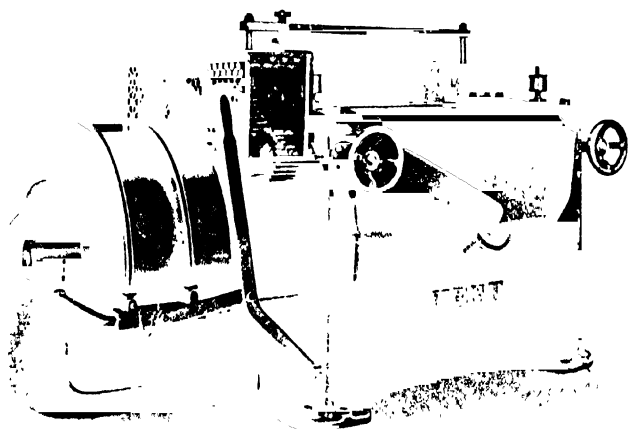
## CATALOG

Send for a copy of our latest catalog.



No. 28 A

LIQUID AND SEMI PASTE MIXERS  
60 to 100 gallons capacity



Nos. 59 and 59-A

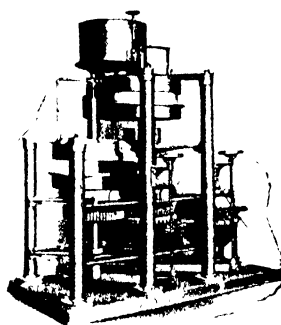
CHILLED ROLLER MILLS

Water cooled or steam heated  
6" x 14", 9" x 24", 12" x 30", 16" x 40"



No. 27

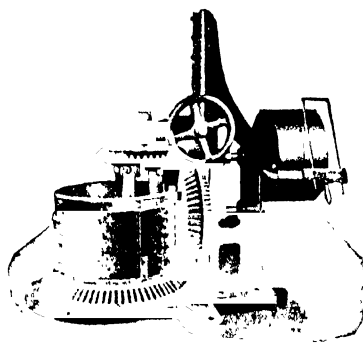
MIXER WITH MACHINE CUT GEARS



No. 50

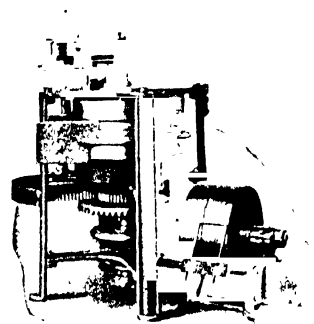
TANDEM MILLS

20, 22, 26 and 30 inches diameter



No. 23-B

PONY MIXERS  
Various sizes



No. 22-A

WATER COOLED FINE COLOR MILLS

# KENT MILL COMPANY

Manufacturers of

Pulverizing, Crushing and Screening Machinery  
Mining Fertilizer and Cement Machinery

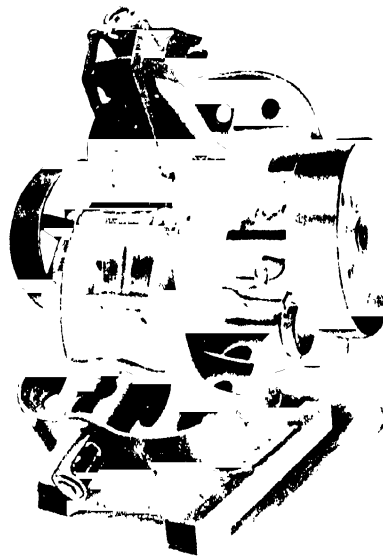
10 RAPELYE STREET, BROOKLYN, N. Y.

## PRODUCTS

Pulverizing, Crushing and Screening Machinery.  
Mining Fertilizer and Cement Machinery.

### MAXECON MILL

A pulverizer constructed and operated on the principle of a free vertical concave ring yieldingly supported on three rolls pressing against its inner face. The ring revolves, so that material fed on its inner face is held there by centrifugal force, revolves with the ring and passes under the rolls which are held up to the work by heavy springs. The rolls crush the material against the ring and discharge it through the bottom of the mill. The ring and three rolls are the wearing parts.



MAXECON MILL

**Feed**—Grinds hard or soft friable material from 2" down.

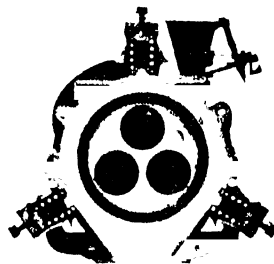
**Output**—From 1 to 20 tons per hour, according to size of mill, kind and hardness of material.

**Fineness**—From  $\frac{1}{4}$ " to 200 mesh.

**Adaptability**—The Maxecon Mill has proved itself especially advantageous in many branches of the Chemical Industry.

Some of the materials it grinds are as follows:

Coal, Coke, Bauxite	for Aluminum
Ivory Nuts	" Lactic Acid
Iron Borings	" Waterproof Compounds
Limestone	" Cement and Fertilizer
Cement Clinker	" Cement
Calcined Magnesite	" Refractory Bricks, Linings, etc.
Phosphate Rock	" Fertilizer, Phosphoric Acid
Ores of Various Kinds	" Preparation for treatment
Quartz, Traprock, etc.	" Road Surfacing



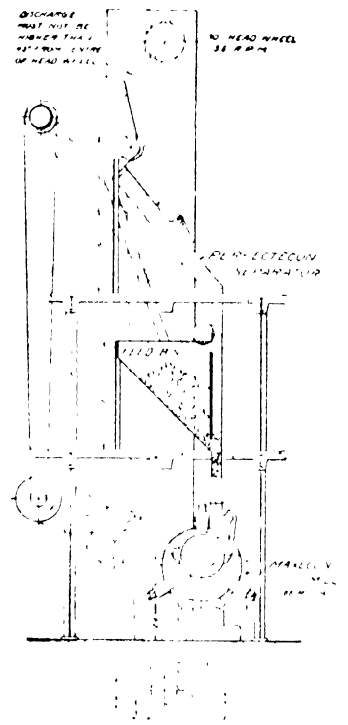
CROSS-SECTION OF MAXECON MILL

**Power**—Varies with work, but customers report saving of 50% to 80% over other pulverizers.

**Repairs**—Vary with abrasiveness of material ground, but again customers report savings from 50% to 80%.

### A FEW OF OUR CUSTOMERS

Virginia-Carolina Chem Co (21 plants)  
U. S. Steel Corporation  
Cayuga Portland Cement Co  
Southern Agri Chem Corp  
Harbison-Walker Mfg Co  
Aluminum Ore Co  
F. S. Royster Guano Co  
Amer Refractories Co  
U. S. Aluminum Co  
Ammono Phos Corporation



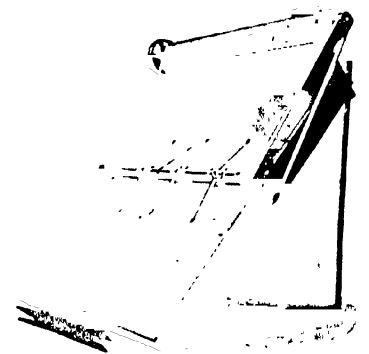
A COMPLETE MAXECON MILL INSTALLATION

Our American Air Separator is best for all products finer than 80 mesh.

Maxecon Mill, Perfectecon Separator, and Elevator taking feed 2" and finer and grinding and screening a product down to 80 mesh fineness.

### PERFECTECON SEPARATOR, Best for coarse

An inclined screen of the vibrating type having a distributing conveyor, a scalper to save the fine cloth. Three screen frames arranged step fashion one above the other, with a dam to check flow of material from one frame to the next, allowing material to pass over screens slowly, assuring maximum output. Screen surface positively vibrated by cam actuated hammers and knockers. All steel construction to assure longest life.



PERFECTECON SEPARATOR

# KEWAUNEE MANUFACTURING COMPANY

## Laboratory Furniture Experts

KEWAUNEE, WISCONSIN

### PRODUCTS:

Laboratory Furniture for Commercial Laboratories, Industrial Plants, Educational Institutions, Hospitals, etc., consisting of Physics, Chemistry, Biology, Agricultural, Electrical, Physiography and General Laboratory Furniture; also Domestic Science and Domestic Art, Drafting-Room, Manual Training and Kindergarten Furniture.

### FACILITIES:

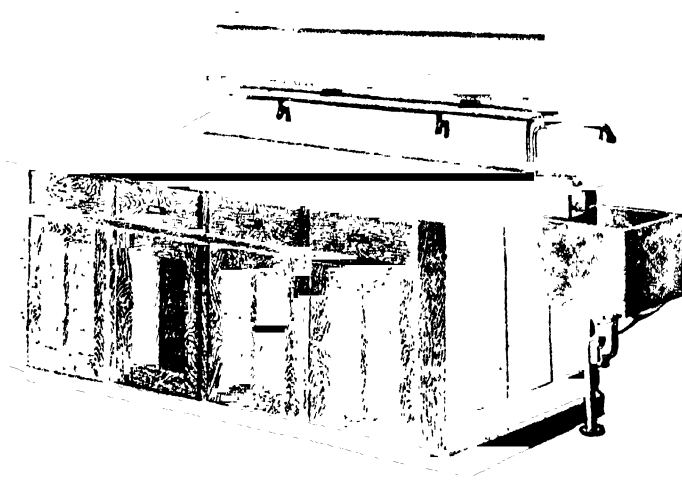
The correct manufacture of modern laboratory furniture requires an exactness and special attention to detail that cannot be performed by untrained or inexperienced workmen. Our years of experience devoted exclusively to the production of laboratory furniture, our complete factory equipment of modern cabinet-making machinery, with skilled cabinet-makers trained in this special work, our extensive floor space and vast dry kiln and tempering-room capacity, enable us to extend intelligent service and to supply laboratory furniture of the very best type of construction, of quality and of adaptability.

### CONSTRUCTION:

The quality and stability of Kewaunee tops has always been conceded to be without equal. We developed and perfected what is known as our Automatic Take-up for Table Tops. This invention consists of a steel rod set in the top, and at each end of this rod is placed a washer, then a heavy compress spring, another washer and a nut. The springs are gauged to resist in equal measure the expansive force of birch. If the top should swell slightly, the springs instantly retard that action with heavy pressure, yet do not crush the joints or break the glue like the plain bolt. It is natural then, when the wood shrinks back to normal, the springs reciprocate and assist the action and that they have taken almost all the strain off the glued joints. The careful curing of the heavy birch for our table tops, with this additional safeguard against possible trouble under severe changes in humidity, and the successful "Kewaunee" carbonized black acid-proof finish on the working surface, gives to the scientist a table top that is supreme in every test of materials or products for this laboratory purpose.

### BLUE PRINTS:

Blue prints, showing locations of floor connections, will be sent on request to prospective customers. We will make drawings gratis, upon receipt of specifications.



CHEMISTRY DESK FOR RESEARCH AND ANALYSIS

# KESTNER EVAPORATOR COMPANY

18th Street and Allegheny Avenue

PHILADELPHIA, PA.

London  
5 Grosvenor Gardens, Westminster

Lille  
7 Rue de Toul

## PRODUCTS:

**Evaporators** Single and Multiple, Vacuum and Pressure, Fireheated, Salting

**Spray Dryers** Liquids to Powder

**Heaters, High Speed, multipass**

**Filters**

**Chemical and Engineering Problems in connection with Evaporation and Filtration.**

## GENERAL:

Kestners are evaporating today more than 55,000,000 pounds of water per hour.

They have handled their share of war work and are now prepared to take up the new problems of peace.

For many years—in fact, since Kestners were first put on the market—they have been in the advance in the evaporating field all over the world. Many competitors have attempted to imitate our special features, but none have been successful in accomplishing our results.

In Double Effect we evaporate 2.05 lbs. of water per lb. of steam used.

In Triple Effect we evaporate 3.15 lbs. of water per lb. of steam used.

In Quadruple Effect we evaporate 4.20 lbs. of water per lb. of steam used.

In Quadruple Effect with 5 lbs. steam pressure doing 80% evaporation and *including the pre-heating* of the liquid from 70° F. we evaporate 3 lbs. of water per lb. of steam used.

We build special types for special work and make a careful study of each separate problem.

## FEATURES:

Among the special features of the Kestner are:

**Time**—The entire evaporation in a Kestner takes place in seconds as compared with hours in other types. Thus, in a Triple Effect the liquid is in contact with the heating surface about 30 seconds in each body, or 6 minutes elapse from the time the liquid enters the first body until it is discharged from the last body, fully concentrated. Sensitive materials, as gelatin, glue, wood extracts, etc., are not injured as to flavor or color.

**Greater Evaporation** per pound of steam. 15% more than our competitors in most cases and 50% more in many.

**No Entrainment**, even on the most foaming liquids, due to our special separator. Those who have handled foamy liquids on other type evaporators during the war will appreciate the saving this means.

**Gas Extraction** 100% at all times. This means 100% use of the heating surface.

**No Volume of Liquid in Transit.** The Kestner starts the minute the liquid reaches the evaporation station, is discharging within a few minutes and can be shut down almost as soon as the last liquid reaches it.

**Scaling** much less than in other types and generally entirely eliminated, saving time, labor and chemicals.

**Low Cost of Upkeep.** Few joints. No float valves and other automatic controls. Pumps reduced to a minimum.

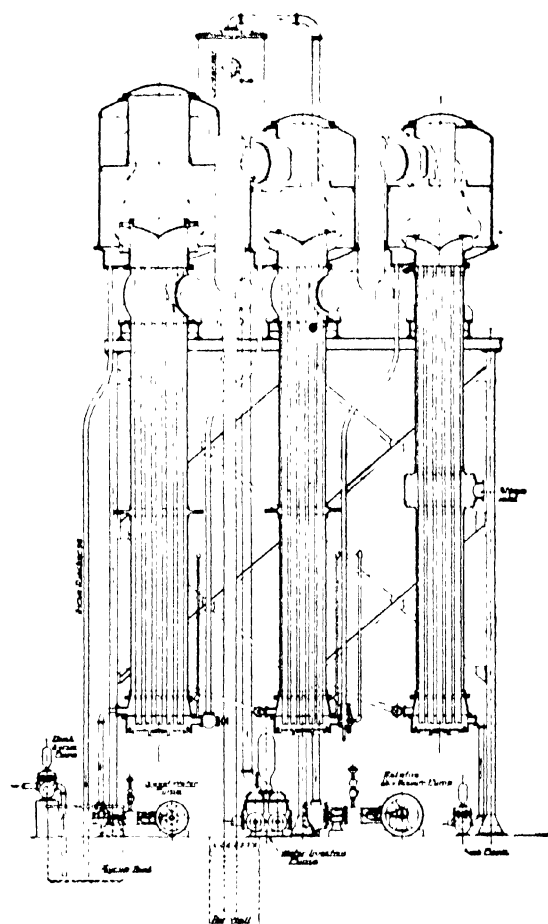
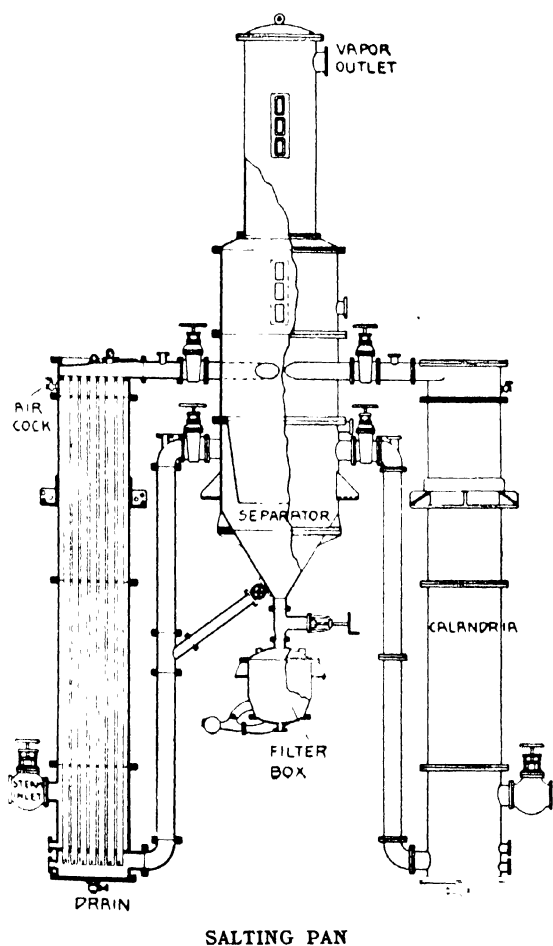
**High in First Cost** as every high-grade machine must be. The savings shown in many cases soon pay the entire cost of the installation.

*Continued on Next Page*



TYPES:

- I Kestner Climbing Film Evaporators for general work under pressure and vacuum, in Single or Multiple Effect, with and without side heatings. Type "CF"
- II Kestner Pre-Evaporators for work under high pressure, producing supplementary steam for use in heating and evaporating. Type "P"
- III Kestner Falling Film Evaporators where high percentage evaporation is required in Single Effect and short time contact between the liquid and heating surface. Either vacuum or pressure. Type "FF"
- IV Kestner Serpentine Evaporators for dry extracts. Type "S"
- V Kestner Echangeur Evaporators for corrosive liquors. Type "E"
- VI Kestner Fire Heated Evaporators. Type "F"
- VII Kestner Salting Pans, Single or Multiple, vacuum or pressure, embodying all the special features of the Kestner types. Type "SP"



SECTIONAL DETAILS, TRIPLE EFFECT EVAPORATOR

- VIII **Additional Heating Surface** to existing apparatus. Not only increases the capacity at start, but because it tends to keep clean the old heating system while not fouling the new, maintains capacity.

SPRAY DRYERS

- I A closed plant drying in a medium of superheated steam, entirely eliminating the danger of fire and explosion.  
Handles the most sensitive materials.
- II A semi-closed system drying in a medium of air where low temperatures are a necessity.  
No loss of product.  
Low cost of production.  
Upkeep charges practically eliminated.

# KEYSTONE DRILLER COMPANY

TRADE MARK  
**DOWNIE**  
REGISTERED U. S. PATENT OFFICE

Manufacturers of "Downie"  
Deep Well and Centrifugal Pumps  
BEAVER FALLS, PA

Cable Address  
"DRILLER", Beaver Falls, Pa.  
BRANCH OFFICES  
170 Broadway, New York  
Moradnock Block, Chicago  
Joplin, Mo.

## PRODUCTS

"Downie" deep well plunger pumps, single and double stroke, steam and geared. Described in Catalog No. 6.

"Downie" Centrifugal Pumps, single and multi stage, horizontal and vertical. Described in Bulletin No. 801.

## "DOWNIE" DEEP WELL PUMPS

These pumps are built in a large variety of types and sizes to meet every deep well pumping condition where steam or any form of driving power is available. Capacities ranging from 85,000 gals. per hour using 18" dia. Working Barrel, down to 250 to 600 gals. per hour using 1 1/4" dia. Working Barrel. They are designed and constructed according to the highest standards of engineering practice, incorporating only accepted scientific principles of operation, and to obtain the highest degree of efficient, reliable and satisfactory operation with minimum cost of maintenance. The power heads can be furnished with any form of drive, belt, rope, chain, gear, or direct drive, from any type of driver.

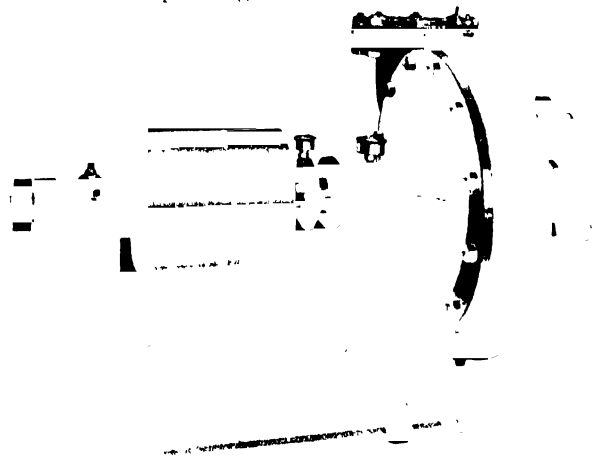
"Downie" Single Stroke Deep Well Pumps, Steam and Geared—Are suitable for pumping moderate quantities of water from a given size well, and where power economy is not so important as it is to keep the initial cost of equipment at a minimum for reliable operation. Guaranteed efficiency on "Downie" Single Stroke Pumps—over 55%.

"Downie" Double Stroke Deep Well Pumps, Steam and Geared—Should be used where a maximum quantity of water is wanted from a given size well, and where the highest possible degree of power economy is desired. These pumps produce an absolute steady

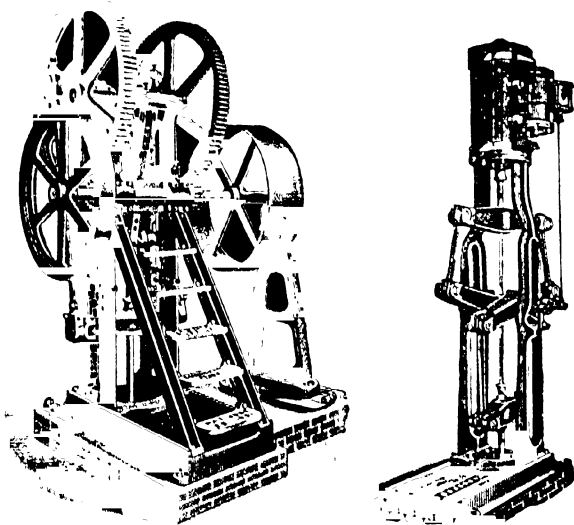
flow of water at the pump discharge. Guaranteed efficiency on "Downie" Double Stroke Pumps—over 80%.

## "DOWNIE" CENTRIFUGAL PUMPS

These pumps include a large variety of types and sizes from 1" to 15" inclusive for capacities ranging from 15 to 10,000 gals. per minute, and to operate against total heads up to 500 ft. or 215 lbs. pressure. They are particularly noted for their ruggedness, simplicity, and exceptionally high degree of economical operation. They can be furnished with any form of drive, belt, rope, chain, gear, or direct drive, from any type of driver. Guaranteed efficiency on "Downie" Centrifugal Pumps—50% to 80%, varying according to size and operating conditions.



"DOWNIE" CENTRIFUGAL PUMP, BELTED TYPE



Geared Type  
Steam Type  
"DOWNIE" DOUBLE STROKE DEEP WELL PUMPS

## ENGINEERING SERVICE

An Engineering Service Department is maintained by the Keystone Driller Co. which is especially prepared to assist in the selection of equipment to fulfill any condition of requirements in the most economical, reliable and satisfactory manner. Those contemplating the installation of deep well pumping equipment are invited to present their problems. This service is free and carries no obligation. In presenting these problems, if the following information is given, as far as possible, in first communication, it will save time and correspondence.

1. Quantity it is desired to pump, per minute, per hour, or per day of so many hours. 2. Pumping depth below ground surface (or mouth of well) when pumping the desired quantity. Note: If unable to give No. 2, state, if possible, the natural standing depth of water below ground surface, and how much it lowered when pumping any given quantity, stating quantity. 3. Vertical lift required above surface (if any), or pressure per sq. inch, into pressure tanks or mains. 4. Dia. of well, down to where it is likely necessary to set Working Barrel, also state total depth of well. 5. State kind of power available and form of drive preferred. Also whether driving power is to be included with pump, and if electric, state voltage if direct current, and cycles phase and voltage if alternating current.

# THE KIER FIRE BRICK COMPANY

Manufacturers of  
Fire Clay Brick and Silica Brick  
OLIVER BLDG., PITTSBURGH, PA.

## PRODUCTS

Fire Clay Brick ("Salina")  
Silica Brick ("Lyon")  
("Yough")

Fire Clays  
Ganister



## GANISTER

We are headquarters for Ganister, having our own quarries located in Pennsylvania with unlimited production facilities.

## FACILITIES

We have large modern kilns, drying floors, and other facilities for production of fire brick in any quantity. We have been 75 years developing our business to its present state. Our experience is at the service of our customers at all times.

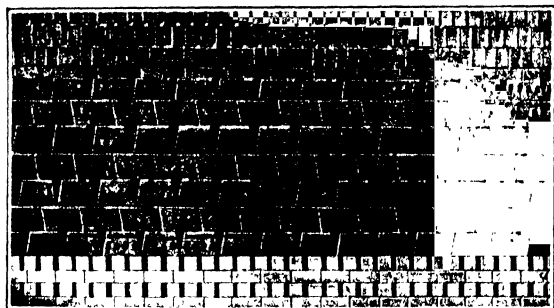
## STANDARD SHAPES

Modern business practice has accepted standardization as one of its most important principles.

Great progress is yearly being made in the refrac-

## SILICA BRICK ("Lyon")

One of our specialties is Silica Brick. Our methods of drying, burning, and cooling give a high temperature perfectly bonded brick with uniform expansion. They are the best brick for use where constant high temperatures are employed. Silica Brick should not be used for furnace settings where high temperatures are reached in a comparatively short period of time and then rapidly cooled off again. For these conditions we recommend our Fire-Clay Brick.



STANDARD SILICA BRICK SHAPES

## FIRE-CLAY BRICK ("Salina")

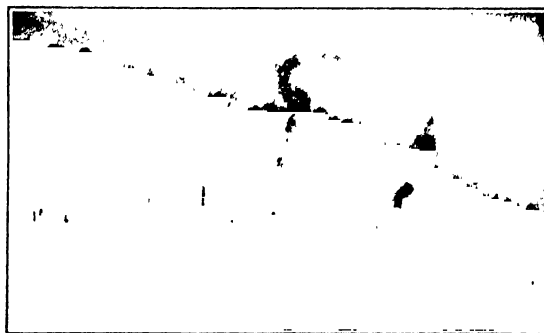
This product, made of the best Pennsylvania clays, has been perfected for all severe conditions of temperature change. It has a number of applications in the chemical plants where a great deal of heating by direct fire is necessary, such as in furnace settings for heating autoclaves, evaporating pans, stills, digesters, etc. Our standard shapes can be used to fit any desired furnace setting.

## YOUGH BRAND SILICA

Our Yough Brand is a high grade special Silica Brick developed by us for heating furnaces where heat conditions are too severe for clay brick and variations in temperature are too great for regular Silica Brick.



SALINA PLANT, SALINA, PA.



CHILDS PLANT, CHILDS, PA.

# THE KILBY MANUFACTURING COMPANY

Sugar Machinery  
And all classes of Heavy Machinery and Foundry Work

MAIN OFFICE AND WORKS

1623 LAKESIDE AVE., CLEVELAND, OHIO

## PRODUCTS

Chemical Equipment to buyers' designs and specifications

Garbage Disposal Machinery

Pulp Drying Plants

Gray Iron and Semi-Steel Castings of every description, rough or machined

Glucose Machinery

Sugar Machinery

Beet Wheels

Beet Washers

Beet Roller Conveyors

Cossette Transporters

Beet Cutters

Diffusion Batteries

Carbonation Stations

Filter Presses

Sulphur Stations

Condensers

Evaporators

"Standard"

"Wellner-Jelinek"

"Pre-Evaporators"

Heaters

Vacuum Pans

Coil

Calandria

Crystallizers

Lime Kilns

Lime Slackers

Lime Agitators

Gas Washers

Steffen Process Machinery

Pulp Dryers

Char Filters

Char Kilns

Char Dryers

Retorts

Tanks, etc.

## SPECIALTIES

Sugar Machinery for Beet and Cane Sugar Factories and Refineries.

Evaporators for all purposes—Sugar, Salt, Chemical Products, etc.



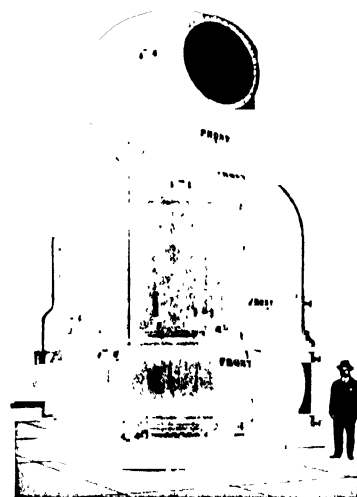
**CAST IRON STEAM BELT**  
Weight 10000 lb Cast in One Piece and Split

**CAST IRON CASTING**  
Weight 44000 lb

## MANUFACTURING FACILITIES

Modern Machine, Pattern and Tank Shops and Gray Iron and Semi-Steel Foundry.

Our Plant is equipped to make and machine the



14' 0" CALANDRIA VACUUM PAN

largest castings required in the construction of modern evaporators and other heavy machinery.

We have drawings and patterns of all kinds of Sugar Making Machinery and our experience, engineering and manufacturing facilities are of the best.

We are also fully equipped for manufacturing all classes of machinery to engineers' specifications and blueprints.



TOP VIEW OF A 14 CELL CIRCULAR DIFFUSION BATTERY

# THE KIER FIRE BRICK COMPANY

Manufacturers of  
Fire Clay Brick and Silica Brick  
OLIVER BLDG., PITTSBURGH, PA.

## PRODUCTS

Fire Clay Brick ("Salina")  
Silica Brick ("Lyon")  
("Yough")

Fire Clays  
Ganister



## GANISTER

We are headquarters for Ganister, having our own quarries located in Pennsylvania with unlimited production facilities.

## FACILITIES

We have large modern kilns, drying floors, and other facilities for production of fire brick in any quantity. We have been 75 years developing our business to its present state. Our experience is at the service of our customers at all times.

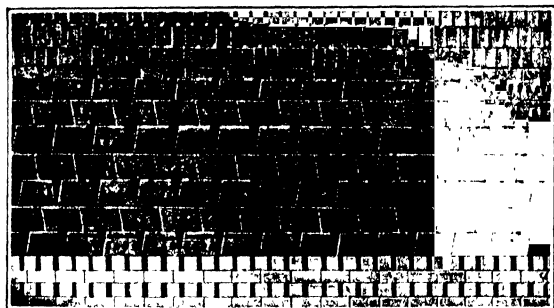
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Great progress is yearly being made in the refrac-

## SILICA BRICK ("Lyon")

One of our specialties is Silica Brick. Our methods of drying, burning, and cooling give a high temperature perfectly bonded brick with uniform expansion. They are the best brick for use where constant high temperatures are employed. Silica Brick should not be used for furnace settings where high temperatures are reached in a comparatively short period of time and then rapidly cooled off again. For these conditions we recommend our Fire-Clay Brick.



STANDARD SILICA BRICK SHAPES

## FIRE-CLAY BRICK ("Salina")

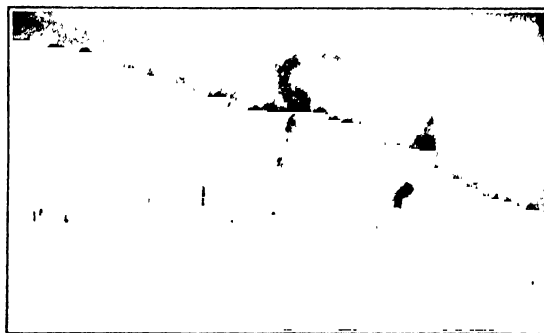
This product, made of the best Pennsylvania clays, has been perfected for all severe conditions of temperature change. It has a number of applications in the chemical plants where a great deal of heating by direct fire is necessary, such as in furnace settings for heating autoclaves, evaporating pans, stills, digesters, etc. Our standard shapes can be used to fit any desired furnace setting.

## YOUGH BRAND SILICA

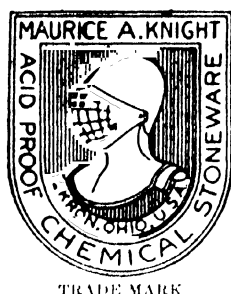
Our Yough Brand is a high grade special Silica Brick developed by us for heating furnaces where heat conditions are too severe for clay brick and variations in temperature are too great for regular Silica Brick.



SALINA PLANT, SALINA, PA.



CHILDS PLANT, CHILDS, PA.



## MAURICE A. KNIGHT

Manufacturer of

Acid Proof Chemical Stoneware, Acid Brick,  
Special Ware and Pipe

OFFICE AND FACTORY

KELLY AVENUE, EAST AKRON, OHIO



### PRODUCTS (PARTIAL LIST)

Acid Eggs, Chemical Stoneware  
Acid Proof Chemical Stoneware  
Arsenic Acid Plants  
Brick, acid proof  
Balls, hollow acid proof stoneware  
Blowcases, acid proof stoneware  
Covers, acid proof stoneware  
Cocks, acid proof stoneware  
Check Valves, acid proof stoneware  
Carboy Stoppers, hard or porous, stoneware, acid proof  
Cement, acid proof  
Chemical Stoneware, acid proof  
Coils or worms, stoneware, acid proof  
Dipping Baskets, acid proof stoneware  
Distributors, open type tower, acid proof stoneware  
Distributors, closed type tower, acid proof stoneware  
Evaporating Pans or Dishes, acid proof stoneware  
Ejectors, acid proof stoneware  
Funnels, acid proof stoneware  
Faucets or Spigots, acid proof stoneware  
Filters, suction, acid proof stoneware  
Injectors, acid proof stoneware  
Jars, storage, acid proof stoneware  
Jars, acid proof stoneware  
Jets, steam, acid proof stoneware  
Kettles, acid proof stoneware  
Muriatic Acid Plants, acid proof stoneware  
Manifolds, acid proof stoneware  
Nitric Acid Plants, acid proof stoneware  
Pipe and Fittings, acid proof stoneware  
Pots, stoneware, acid proof  
Pitchers, acid proof stoneware  
Radial Tile, acid proof stoneware  
Return Bends, acid proof stoneware  
Rolls, wire, acid proof stoneware  
Receivers, stoneware, acid proof  
Storage vessels, acid proof stoneware  
"S" Pipe, acid proof stoneware  
Sinks and Traps, laboratory, acid proof  
Stirrers or agitators, stoneware, acid proof  
Sulphuric Acid Towers, acid proof stoneware  
Stoneware, chemical, acid proof  
Tanks or vats, stoneware, acid proof

Tile, floor or lining, acid proof  
Tourills, cellarius, stoneware, acid proof  
Towers, condensing or absorbing, acid proof, stoneware  
Tower packing or filling, stoneware, acid proof  
Tile, digester lining, acid proof stoneware  
Tower lining, acid proof stoneware  
Tile, Radial, acid proof stoneware  
Valves or cocks, stoneware, acid proof  
Wire Rolls, acid proof stoneware

### THE KNIGHT LINE

The Knight line of Chemical Stoneware includes every description of Chemical and Acid Proof Stoneware Apparatus, either standard or special. Whatever is your need in this direction we can supply it—with the Stoneware that is acid proof throughout the entire body.

### KINDLY NOTE

That the types shown illustrate the more common forms of Chemical Stoneware we manufacture.

That they can be modified or changed to suit your requirements.

That we can make Chemical Stoneware to your order from your blueprints or sketches no matter how complex.

That our ware is not the cheapest nor is it fancy, is fully guaranteed to be Acid Proof throughout the entire body; free from such defects as checks, cracks or blisters; will not leak or sweat, and is satisfactory in every respect.

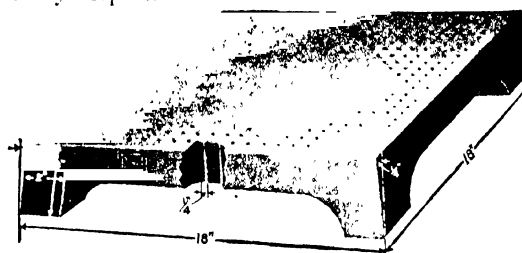


FIG. 140, ACID PROOF DRAINER OR BLOW PIT TILE

Made in four standard sizes

18" x 18" x 4" (shown above)  
12" x 18" x 4"  
12" x 12" x 3"  
12" x 6" x 3"

Also used as filter tile for large tank filters. Made flat without corner lugs

*Continued on Next Page*

**OPEN DISTRIBUTOR TYPE ACID TOWER**

Used where a finely divided flow of liquid is not required, or in condensation work, when distributor plate may be omitted. Parts shown, reading from bottom are:

- 1 Cascade or saucer bottom.
- 2 Bottom ring section with Y gas inlet
- 3 Plain intermediate tower section.
- 4 Intermediate ring section with perforated support plate
- 5 Ring section with open type distributor plate and cover, with sock-
- 6 Return bend or goose neck with sock-

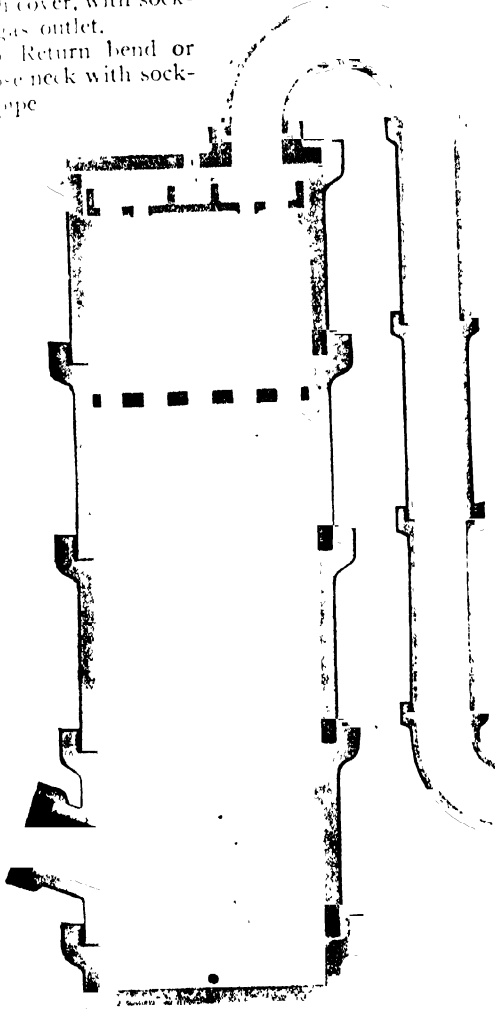


FIG. 100

Made in all sizes and designs, with all kinds of packing and fittings from 12 inch to 42 inch bores. Sections interchangeable with Fig. 101.

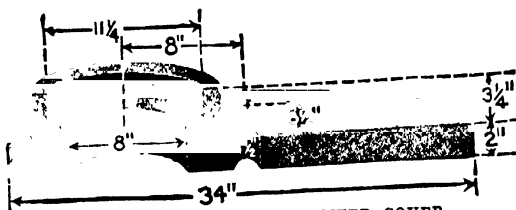


FIG. 108, ACID PROOF TOWER COVER

Used with internal distributing plate and doing away with Y or Tee outlet top section. Used with open type distributor, made in any size or bore tower from 12-in. to 42-in. above size for 30-in. bore tower.



FIG. 110, CLOSED TYPE ACID PROOF TOWER DISTRIBUTOR, ASSEMBLED

Made to fit any size or bore tower from 12-in. up to 42 in.

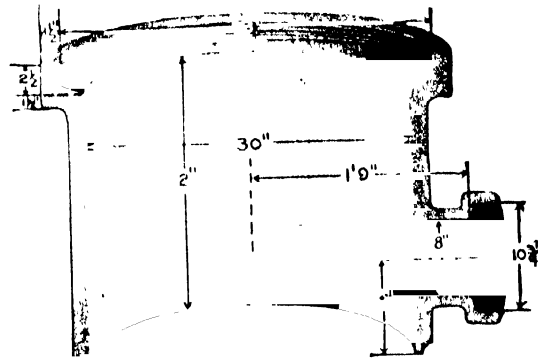


FIG. 127, ACID PROOF TOWER TOP OR BOTTOM SECTION

Or can be used as inlet bottom section by using cascade. Made in any bore from 12 in. up to 48 in.

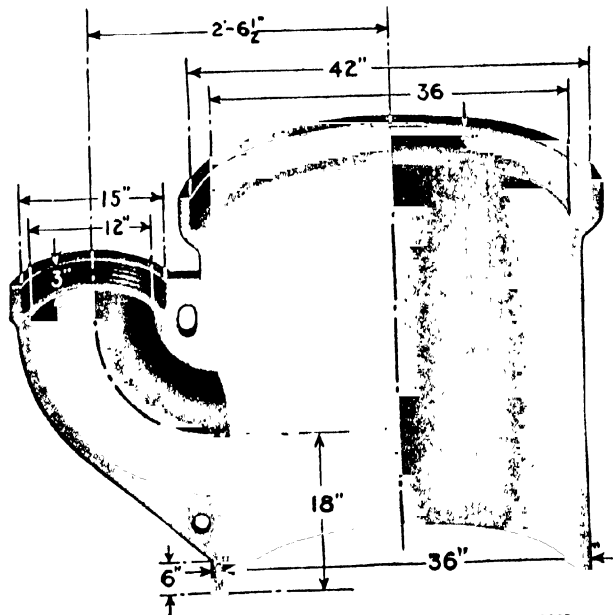


FIG. 120, STANDARD 36" TOWER BOTTOM SECTION

With 90°, 12" gas inlet. Used with Cascade or Saucer bottom. Same design used in other size towers. Can also be used as top tower section and gas outlet.

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**Our Motto** Service and honesty in deliveries.  
We do not give a promise of quick delivery to procure your order, then disappoint you.  
Made in America by Americans who know how.

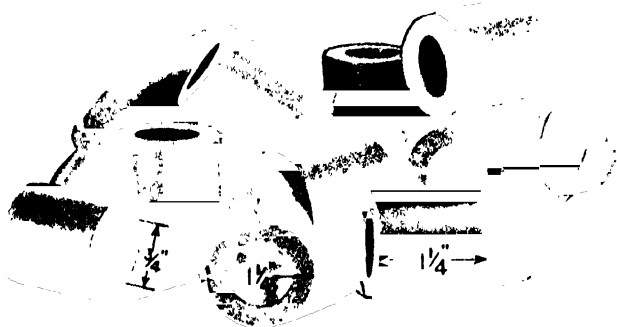


FIG. 129, SMALL TUBE TOWER PACKING

Used at top of towers over larger packing such as brick and rings to give better distribution of liquid over tower. Also as entire filling for small bore towers. Carried in stock.

FIG. 130, LARGE ACID PROOF TOWER BASE TILE

Used for bridge work at bottom of large sulfonic acid towers for supporting packing. Made in any sizes up to 60 in. by 36 in. by 6 in.

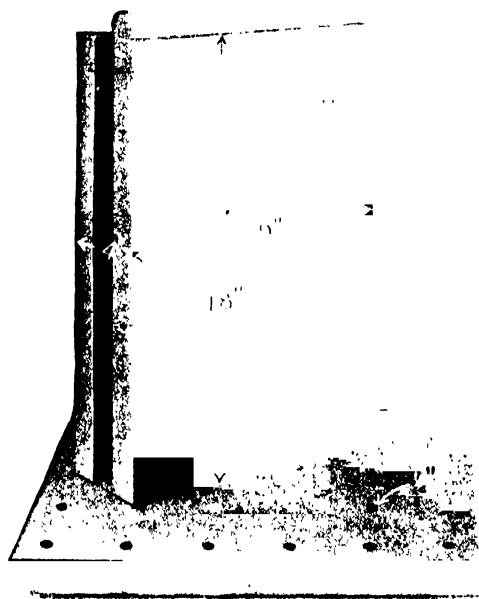


FIG. 130, LARGE ACID PROOF TOWER BASE TILE

Used for building large tanks or filters. Made in most any size or radius with any size perforations.

A Stoneware that is Acid Proof and Vitrified all the way through.

Our Ware is not dependent upon a Glaze, Enamel or Veneer.

### It is the body itself.

Withstands the action of Acids, Alkalis and Chemicals, strong or weak, hot or cold.

Our entire organization has been making acid proof Chemical Stoneware for over 15 years, and our present enlarged activities include the making of **Every Description** of acid proof Chemical Stoneware, from small pieces to complete plants.

### KNIGHT ACID BRICK

The brick that is made under 2-Ton pressure.

The brick is made of 3 different clays.

The vitrified brick that is Salt glazed. The Knight Acid Brick.

FIG. 130, ACID PROOF VITRIFIED BRICK

Made in most any size or shape. Standard size 8 in. by 4 in. by 2 1/4 in. Carried in stock with No. 1 and No. 2 arch. Used for packing and lining Glover or Gay Lussac Towers or large Storage, or Galvanizing, or Pickling Tanks.

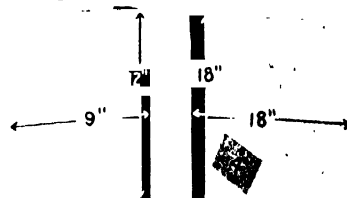


FIG. 137, ACID PROOF RADIAL TILE

Made in any size or radius for building towers or tanks.

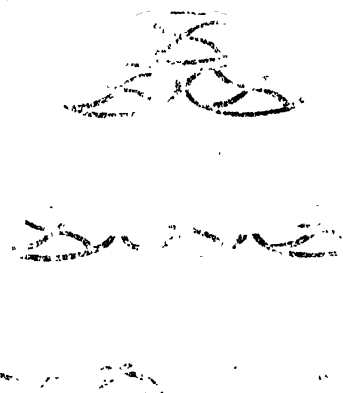


FIG. 132, ACID PROOF PARTITION RINGS

The most popular tower packing for any kind or size tower. Note the curved partitions. These rings afford a good draft and a maximum scrubbing surface. Made in three standard sizes—4 in. by 3 in., 6 in. by 4 in., 6 in. by 6 in.—carried in stock.

*Continued on Next Page*



# ILLUSTRATING TYPES OF PIPE AND FITTINGS

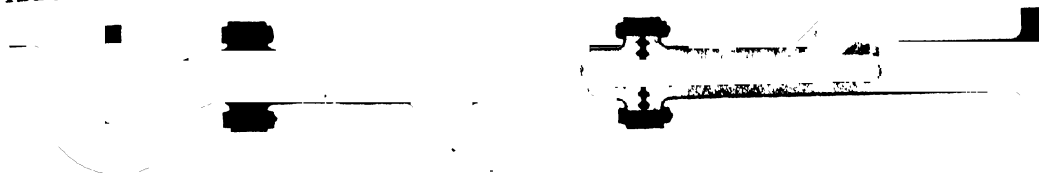


FIG. 240, ACID PROOF GROUND AND GROOVED BOLT HOLE FLANGED PIPE

Used on pump, trap, straight "T" and sanitary "T" fittings. Flange of pipe is bolted together with asbestos wicking placed in grooves. Made in any bore up to 6 inches and in all kinds of fittings for waste lines in buildings and other purposes.

Also used for pressure lines. Up to 10 lbs. per sq. in. or in hot water work for drainage. Flanges are of same type as steel or cast iron except are with slotted bolt holes. Asbestos wicking soaked in oil used in the grooves shown on flange in cut.



FIG. 280, ACID PROOF CONICAL FLANGED PIPE LINE AND FITTINGS

Used on pump or pulsometer lines, and for other purposes, showing straight length, stopcock, 90° elbow and return bend.

Used on pump or "blow case" lines. Requires gasket and special iron taper collars. Not quite as economical to install as the ground and grooved bolt hole type, but stronger in the joints, and permits fittings to be turned to any radius.

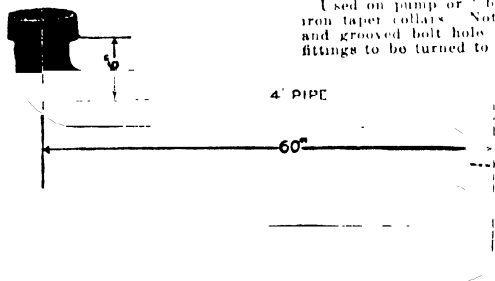


FIG. 260, 4-IN. BY 5-FT. CENTER SOCKET 8-PIPES

Used as condensers or for precooling gases or in place of coils or worms. Any number can be used joined together, made in any bore from 2 in. to 10 in., any center, 2 ft. to 8 ft.



FIG. 271, STRAIGHT LENGTH SOCKET PIPE

Notice deep and heavy grooved sockets. Standard lengths 1 to 3', special lengths up to 12'.



Fig 272-A

Fig 272 B

ACID PROOF 90° AND 45° BELL AND SOCKET ELBOWS  
Also make any degree elbow.

FIG. 261, STANDARD ACID PROOF SLIDE DAMPER

Made in any bore pipe. Flange or socket. Used for shut-off in gas lines, made to fit any bore pipe line.

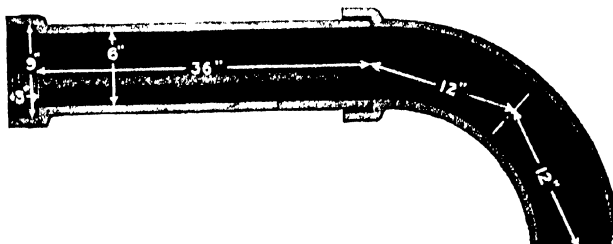


FIG. 275, ACID PROOF TROUGH OR SPLIT PIPE

Made in any bore and lengths with fittings such as "Y's," Tees and Joints.

FIG. 273, ACID PROOF "T" BELL AND SOCKET PIPE

We make acid proof pipe in any bore from 1/4 in. up to 42 in., and with all kinds of fittings.

Continued on Next Page

### STANDARDIZE WITH KNIGHT CHEMICAL STONEWARE FAUCETS

The faucets that are tested to 60 lbs. pressure.

The faucets that are guaranteed to be acid proof and not to leak. The faucets with the lathe cut screw thread. These are Knight faucet features. The faucets for tight connections. Key and key seats that are tight and true.



FIG. 290, ACID PROOF THREADED DRIPLESS FAUCET

With apron on key to prevent possible acid spray from reaching hands or face should key become unseated.



FIG. 291, THREADED SPIGOT

The flow is through the key.

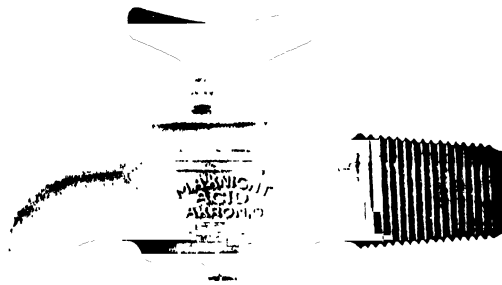


FIG. 292, THREADED BIG FAUCET

All made in any bore up to 4 in. Notice knob for holding lead washer.

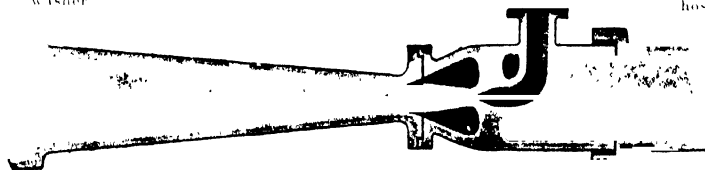


FIG. 117, ACID PROOF SOCKET EJECTOR

For use as gas suction on towers, using compressed air or steam as impelling force.

Send for a copy of our new and fully illustrated folder. It contains information of interest on the subject of acid proof Chemical Stoneware, or come to Akron, Ohio, and visit our plant and see how it is made.



FIG. 293, ACID PROOF PLAIN BIB FAUCET

Made to grind into bars and tanks. Tested to 60 lbs. pressure.

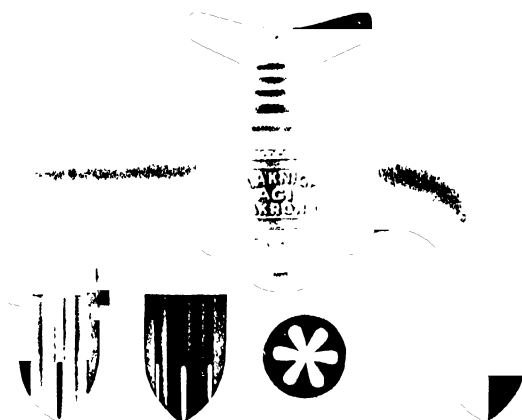


FIG. 294, ACID PROOF PLAIN BIB FAUCET

Showing spray catchers. We make faucets, valves and cocks in any size up to 4 in. bore.

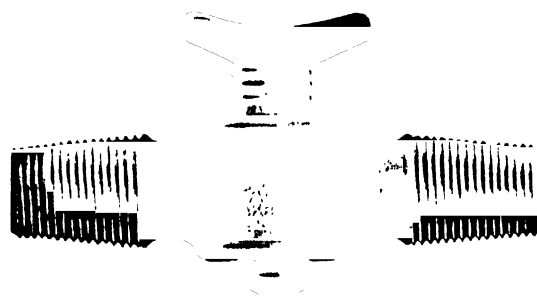


FIG. 295, ACID PROOF THREADED STRAIGHT-WAY COCK

Notice the deep, lathe cut screw threads. The threads are deep and sharp and are designed to screw into either lead pipe or rubber hose thus insuring a tight and strong connection.



FIG. 126, ACID PROOF EJECTOR

For rubber hose or lead pipe connection. With heavy, sharp, machine cut threads. Uses compressed air or steam as impelling force.

*Continued on Next Page*

The threads shown on the faucets are for screwing into lead pipe, wooden pipe, rubber hose or in connection with cement. They are of the taper type and are easily confused with pipe thread such as is used on iron or steel pipe. For connection to iron, steel or brass, the flange type is used.

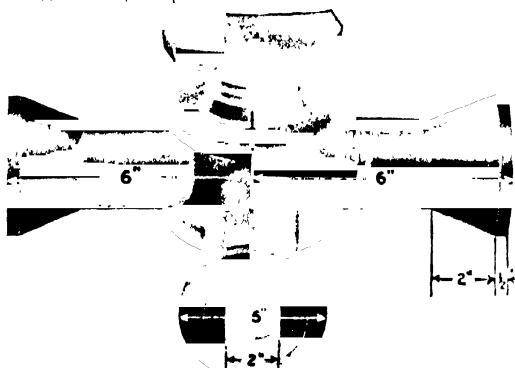


FIG. 303, CONICAL FLANGE THREE WAY VALVE  
Made in any size of three ways and in any bore from 1/4" up to 4"



FIG. 297, FLANGED STRAIGHT-WAY STOPCOCK  
Can be used with flanged pipe. Every key and facet is marked.



FIG. 300, ACID PROOF FLANGED BIB FAUCET  
Faucets and stopcocks are made in any bore up to 4 in. and in all designs. All tested to 60 lbs. pressure and guaranteed acid proof throughout.

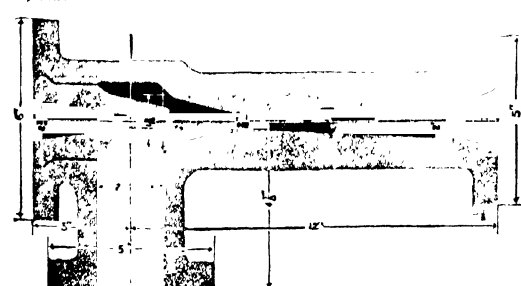


FIG. 128, ACID PROOF FLANGED INJECTOR FOR AIR OR STEAM  
Made in most any design or bore. Used for lifting or forcing solids or gases. See Figs. 117 and 126.

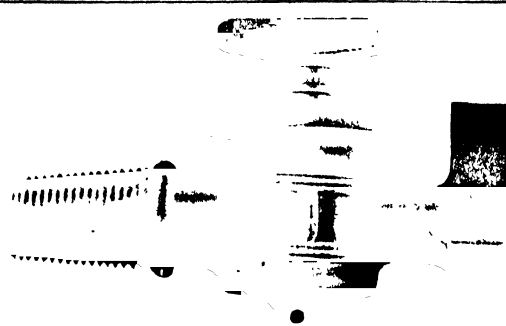


FIG. 299, ACID PROOF FLANGED AND THREADED STRAIGHT WAY COCK  
With apron to prevent possible acid from reaching hand, or free hand to become loose. Tested to 60 pounds.

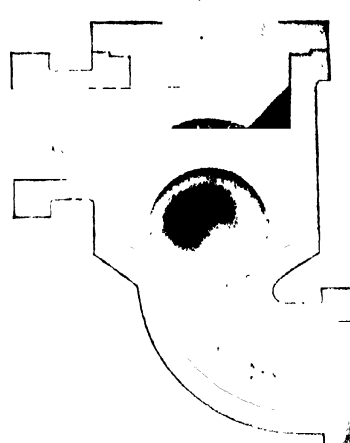


FIG. 302, ACID PROOF CHECK VALVES  
Made in several sizes and designs. Guaranteed.

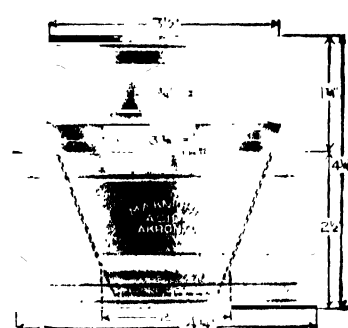


FIG. 301, ACID PROOF DROP VALVE, 2 IN.  
Made in any size.

FIG. 298, BLOCK COCK  
Made in any size, with one or two flats for half in sizes from 1 to 6 in. bore.

FIG. 125, ACID PROOF THREADED STEAM JET

Very simple and effective in stacks and towers. Also made with flange. Often used to develop draft instead of ejectors.

Our Faucets Are Real Faucets in Every Sense of the Word. Once Used, Always Used.

Continued on Next Page



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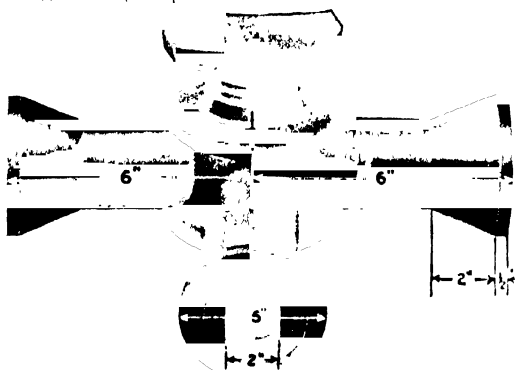


FIG. 303, CONICAL FLANGE THREE WAY VALVE  
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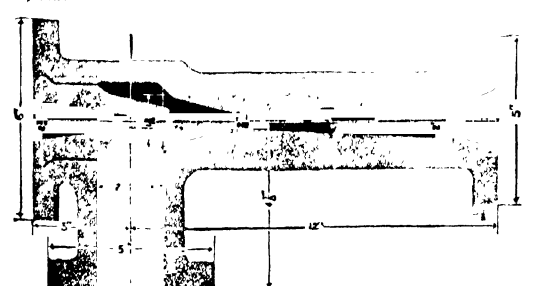


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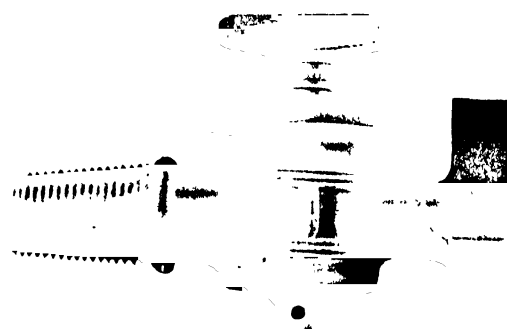


FIG. 299, ACID PROOF FLANGED AND THREADED STRAIGHT WAY COCK  
With apron to prevent possible acid from reaching hand, or face when cock becomes loose. Tested to 60 pounds.

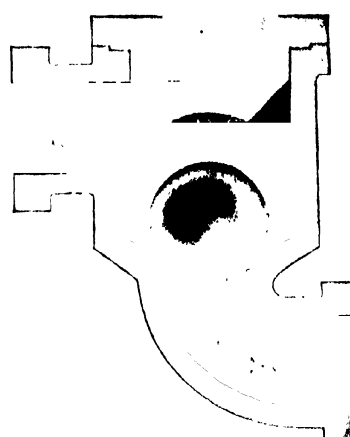


FIG. 302, ACID PROOF CHECK VALVES  
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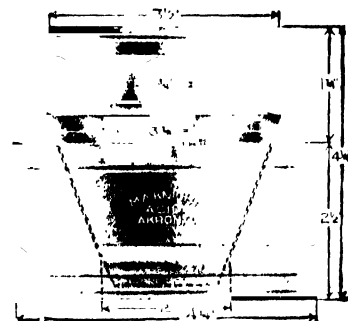


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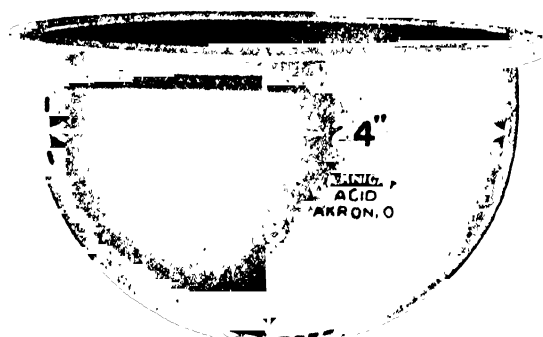


FIG. 186, FLANGED RIM KETTLE, 25 GALLON

Made in any size from 5 to 100 gallon capacity. Used with either sand, water or oil bath when being heated.

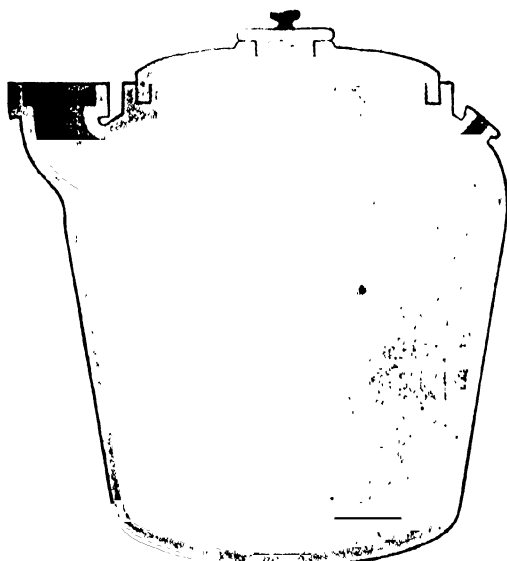


FIG. 180, ACID PROOF NITRATING OR DISTILLING KETTLE

Made in any capacity from 50 to 250 gallons. Cover and outlets or inlets made to meet requirements.

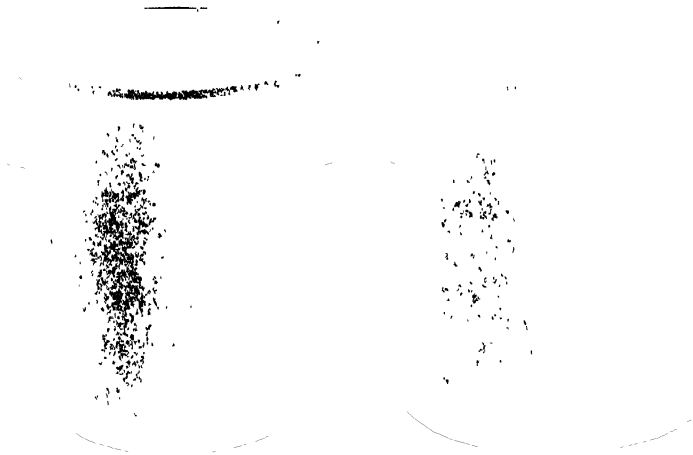


FIG. 200, ACID PROOF, SEMI-TAPER, STORAGE OR MIXING JAR

Made in any capacity from 1 to 500 gallons, with faucet outlets as wished.

FIG. 201, ACID PROOF STANDARD STRAIGHT SIDE JAR

Made in any capacity from 1 to 500 gallons. Outlets and inlets with openings or covers, as desired.

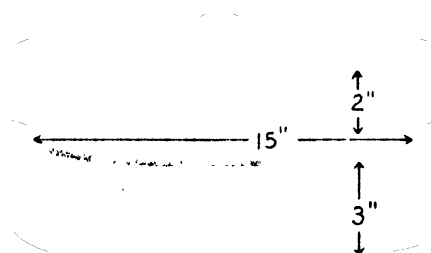


FIG. 215, STANDARD ACID PROOF SUBLIMING PAN

Made in any size.

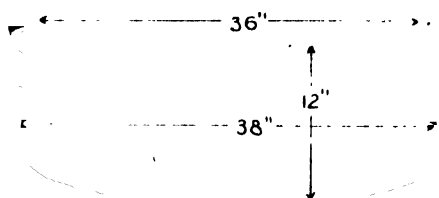


FIG. 216, STANDARD SHALLOW ACID JAR

Made in any size with outlets or fittings as desired.

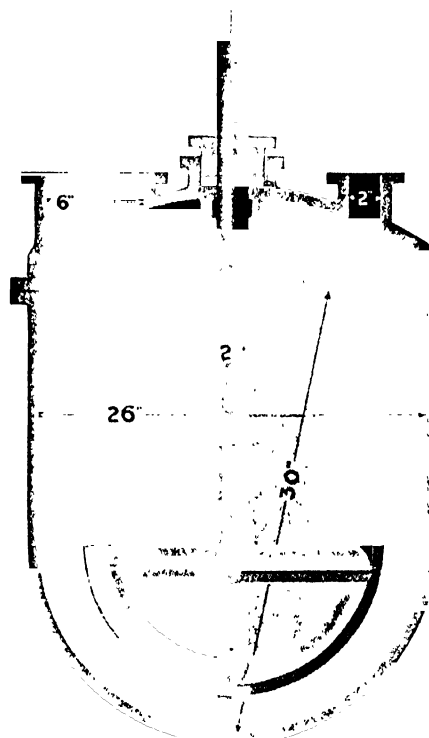


FIG. 182, ACID PROOF NITRATING KETTLE WITH STIRRER

Made in many sizes, with covers and outlets to meet requirements. Note the efficient vane type stirrer, also stuffing box. On large sizes the stirrer is reinforced with a steel rod in center of shaft. Above shows ground flange cover and opening.

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## FILTERS

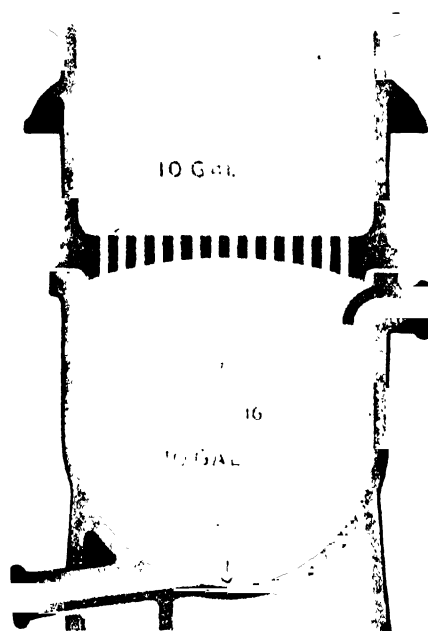


FIG. 285, 20-GAL. ACID PROOF SUCTION FILTER "A"

Made in most any capacity up to 200 gallons. Furnished with faucets and cover if desired.

Used for filtering under heavy suction or vacuum. Filter or perforated plate is built exceptionally strong to withstand heavy duty. For light suction and duty use type B.

We are the only plant in the country which is devoted **Entirely** to the manufacture of acid proof chemical stoneware.

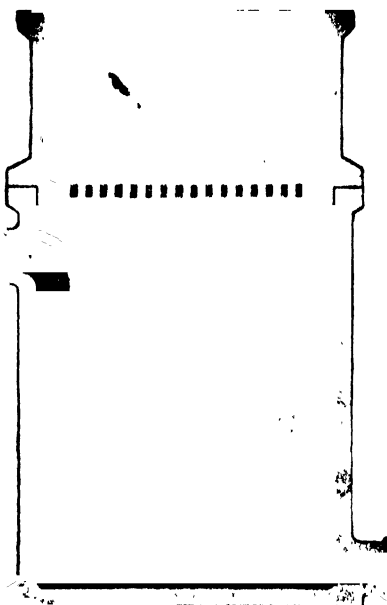


FIG. 286, ACID PROOF SUCTION FILTER "B"

Made in any capacity up to 100 gallons. Furnished with faucets and cover if desired.

Used for open filtering on light or gravity suction, its chief use being in laboratory and similar work. For heavy duty and suction use type A.

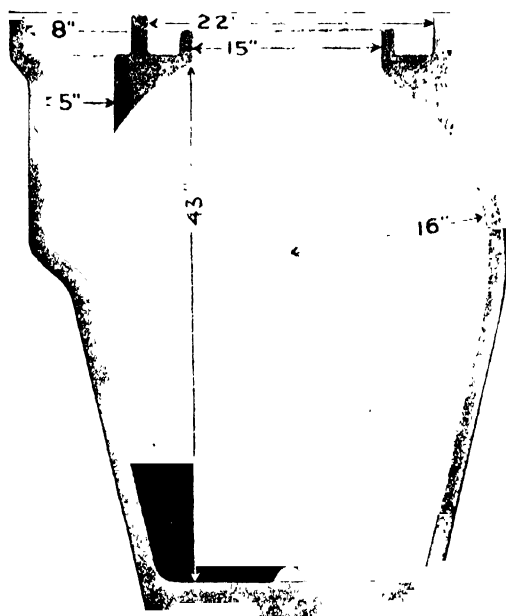


FIG. 175, STANDARD 100 GAL. ARSENIO GENERATOR

Made in all sizes and designs with inlets and outlets as desired.

**REMEMBER IT IS THE BODY ITSELF**

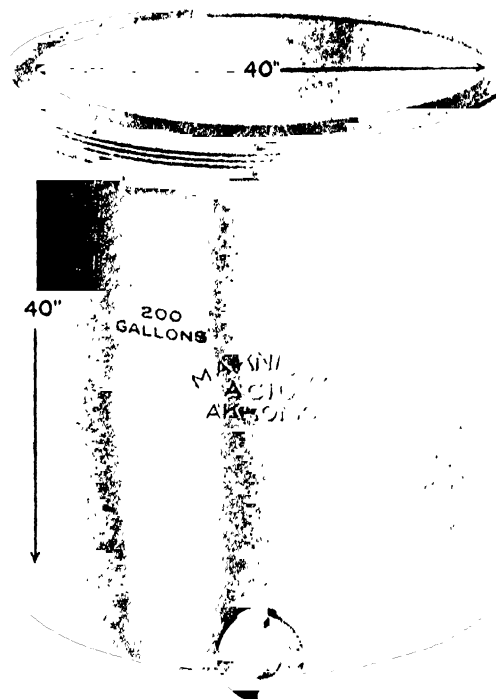
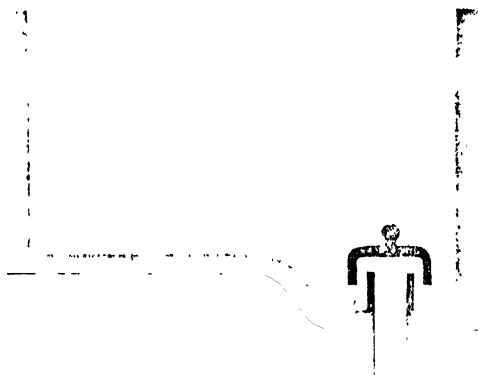


FIG. 202, STANDARD 200 GAL. STRAIGHT SIDE ACID JAR

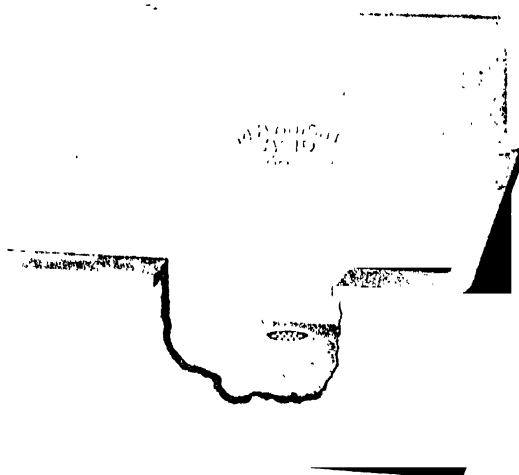
With flanged outlet for flanged faucet. We make Acid Proof Jars in any size or shape up to 500 gallons.

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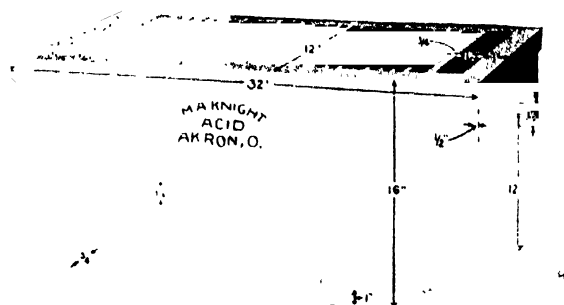
The two sinks shown are to convey an idea of what is possible in this respect. We can make sinks with or without backs, with or without drain boards and with special or plain traps as required. Send us blueprint of your design as we can make the sinks to fit your special requirements.



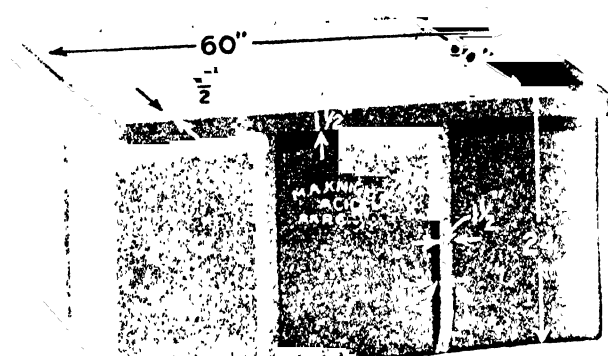
**FIG. 235, ACID PROOF LABORATORY SINK, WITHOUT BACK**  
Showing special trap. Made in all sizes and designs. With complete acid proof pipe waste lines.



**FIG. 236, ACID PROOF LABORATORY SINK, WITH BACK**  
Made in any size or design. With or without back. We make acid proof traps and waste lines, with all kinds of fittings.

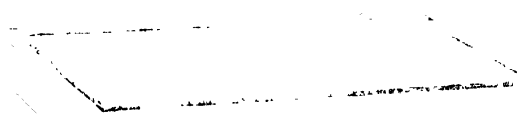


**FIG. 233, ACID PROOF BATTERY OR FORMING TANK**  
Showing plate grooves and partitions. Made in most any size or design.

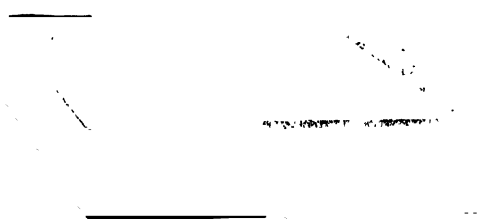


**FIG. 232, LARGE SIZE ONE PIECE TANK**  
With strengthening ribs. Made in many sizes with outlets or partitions as desired.

**FIG. 227, ACID PROOF PHOTO TANK**  
Notice grooves for rods are set in, so that a glass plate covers tank tightly. Furnished with faucet outlets if desired.



**FIG. 226, LOW ACID PROOF TANK OR TRAY**



**FIG. 225, ACID PROOF ETCHING TANK**  
With splash boards and rocker. Made in most any size, ribbed bottom, and outlets.

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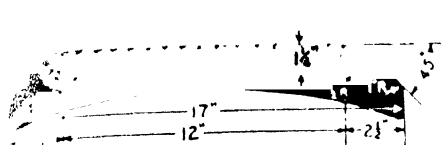


FIG. 312, ACID PROOF PIER INSULATORS

With electrolytic chlorine cells as an insulator  
used to pierce under cells. Made square and



FIG. 321, ACID PROOF FUNNEL

Made in many sizes and designs

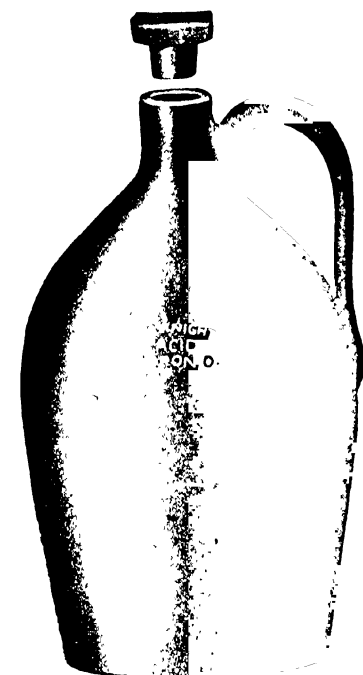


FIG. 323, ACID PROOF JUG

Made in any capacity from one pint up  
to ten gallons. Can be furnished with  
ground acid proof plug or cork. We also  
make Mercury Jugs of capacities of from  
one to ten pounds. Made heavy and durable.


FIG. 326, LARGE LIP, LARGE HANDLE  
ACID PITCHERS

Any capacity, from one pint to six gallons

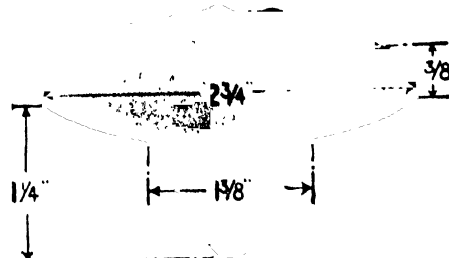


FIG. 327, ACID PROOF BUCKET

Made in capacities from one to ten gal-  
lons. Furnished with or without handle  
or bail.


FIG. 307, ACID PROOF DIPPING  
BASKET

Made in all sizes with perforations  
from 1/8 to 2 in.


FIG. 314, ACID PROOF, WIRE BAIL, CARBOY  
STOPPER

This is a hard vitreous stopper with wide flange.  
Makes a tight fit to top of carboy.

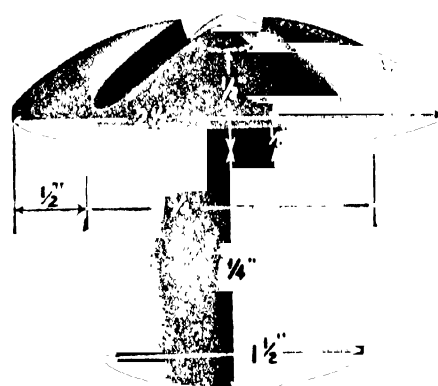
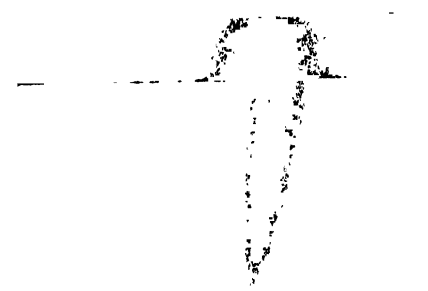


FIG. 312, STANDARD POROUS CARBOY STOPPER

With grooves for wire bail. Although the body  
is hard and tough it is also porous so that the gas  
will escape and not allow carboys to blow up in hot  
weather.


FIG. 315, STANDARD ACID PROOF CARBOY  
STOPPERS

Made true and even, so as to fit neck of carboy  
snug. Carried in stock. Made in several sizes.

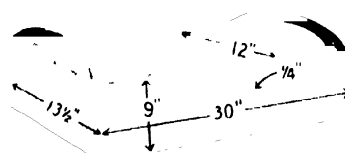


FIG. 306, PERFORATED DIPPING TANK

Made in most any size, with hole from 1/8 to 1-inch.

# JOS. KOPPERMAN & SONS

Coppersmiths and Machinists

308, 310, 312 FLORIST ST., PHILADELPHIA, PA.

NEW YORK

CHICAGO

## PRODUCTS

We design and fabricate any style Column Still, Kettle with or without Agitator, Tank, Autoclave, Condenser, Vacuum Apparatus, Evaporator, Digestor, Subliming Pan, Strike Pan, Crystallizing Pan, or Tanks, Plain or Pressure Percolator, Coating Pan, Separator, Filter, Dreg Still, Non-foaming Plain and Vacuum Still, Coil, Expansion Joint, Piping, Bends, etc., for Chemical, Pharmaceutical, Dyewood and Tanning Extract Industries.

Also for Candy, Food Products, Sugar Manufacturers, Varnish, Wood Alcohol and other allied industries in Copper, Brass, Iron, Lead and Monel Metal.

## EXPERIENCE

We have been in the Coppersmithing business for generations, hence our name "Kopperman." Don't you think we ought to know how? Give us a trial and be convinced.

## FACILITIES

Our Plant is one of the most modern equipped Coppersmithing Shops in the Country. Most machinery and tools used in fabrication of copper work were designed by the Kopperman folks themselves, who being first class practical mechanics themselves, know what equipment is required that will produce a piece of Apparatus that will be neat, durable, and give thorough satisfaction to our customers.

All details of construction are watched by two members of the Kopperman family. Also all tests are witnessed by a Kopperman. The Koppermans are very keen on good and neat work, and have made a host of friends with their untiring efforts—to please their customers.

## SERVICE

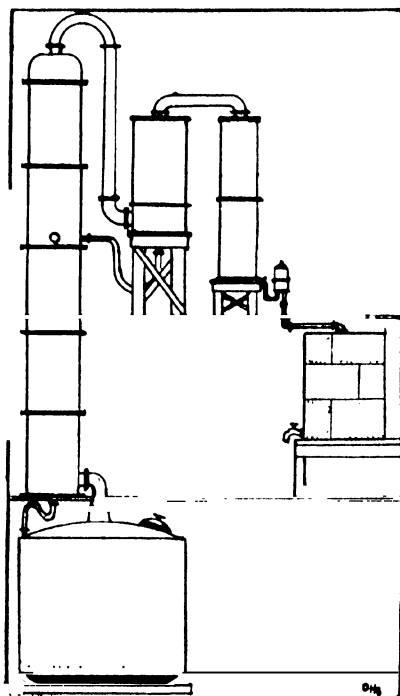
Aside from the work, we have an engineering department which is at your service to make up special designs or help our clients develop designs.

## PRICES, INFORMATION

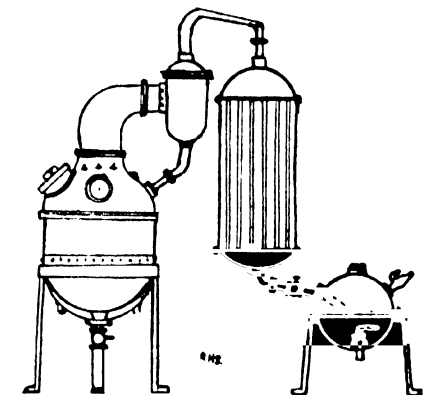
We solicit from the above mentioned industries — inquiries for prices, information, etc. Buyers will find us interesting.



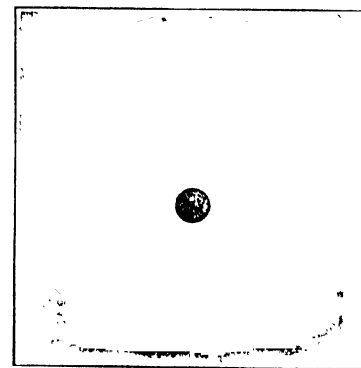
MULTIPLE EFFECT EVAPORATOR



INDUSTRIAL ALCOHOL COLUMN STILL



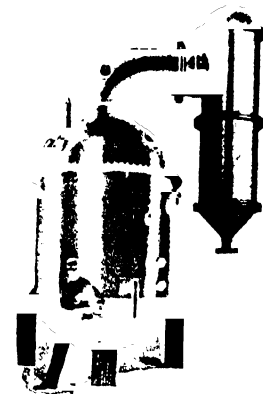
SOLVENT RECOVERY COPPER VACUUM STILL  
With Tubular Condenser and Receiver



12 FT. DIAM. SUGAR COIL VACUUM PAN



COPPER VACUUM RECOVERY STILL  
With Coil Condenser, Vacuum Receiver and Pump Connected



7 FT. DIAM. MILK VACUUM PAN WITH CATARACT CONDENSER

# L. O. KOVEN & BROTHER

MAIN OFFICE: 154 OGDEN AVENUE, JERSEY CITY, N. J.

NEW YORK OFFICE: 50 CLIFF STREET

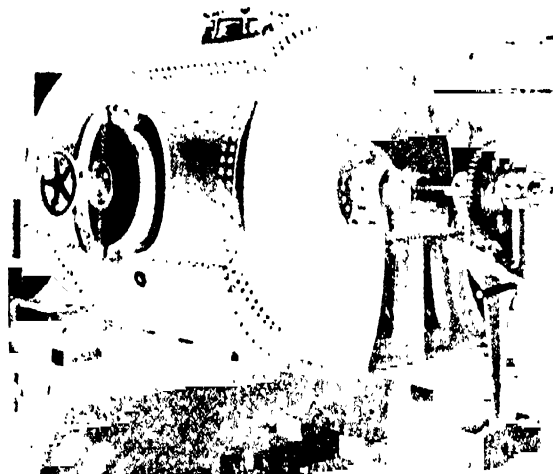
## PRODUCTS

Acid Tanks	Blending Machines
Agitators	Milk Machinery
Autoclaves	Paint Machinery
Steel Barrels	Rubber Reclaimers Ma-
Sterilizing Cars	chinery
Condensers	Mixers, All Kinds
Creosoting Cylinders	Bottle Filling Machines
Hydraulic Cylinders	Enameling Ovens
Coal Chutes	Hydraulic Steel Riveted
Steam Drums	Pipes
Vacuum Dryers	Filter Presses
Oil Filters	Gas Producers
Tank Filters	Air Receivers
Water Filters	Steel Smoke Stacks
Melting Furnaces	Bottle Sterilizers
Feed Water Heaters	Oil and Tar Stills
Oil Heaters	Gas Scrubbers
Humidifiers	All kinds of Tanks
Automatic Weighing	Water Stills
Machines	
Copper Kettles, Iron or Brass, any design	

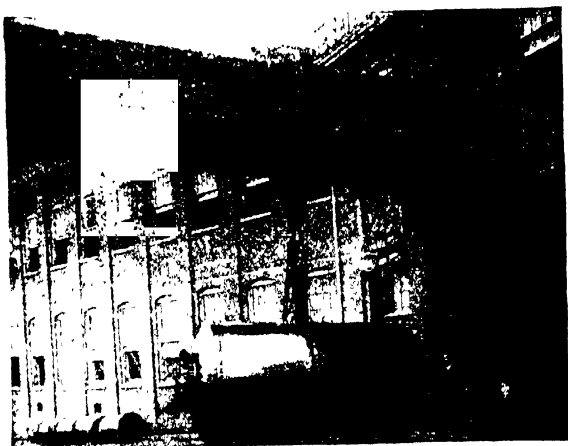
## FACILITIES

We are Engineers, Designers, and Constructors of Plate and Sheet Metal Work for All Industries.

Tank Builders, Machinists, Coppersmiths, Galvanizers, Builders of Apparatus for Chemical Works.



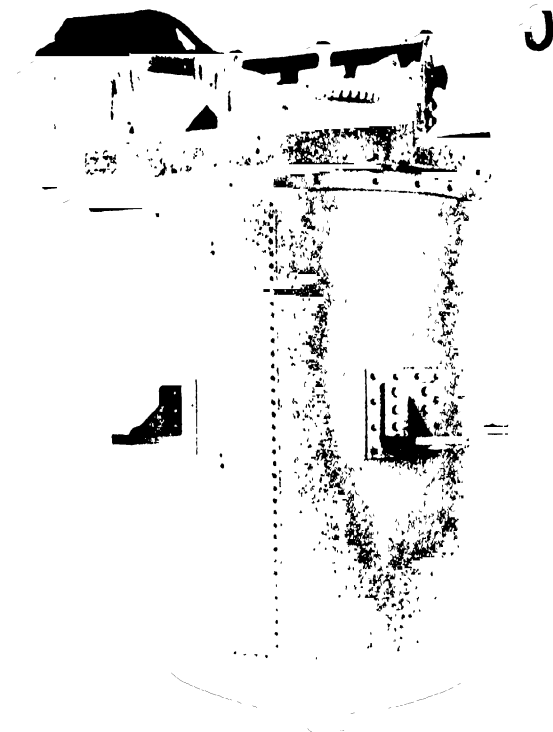
**TUMBLING MILL**  
Part Jacketed with Worm Hand Drive



**HIGH PRESSURE STORAGE TANKS**



**BATTERY OF MIXERS FOR HEAVY DUTY**



**DIRECT DRIVEN VERTICAL MIXER**  
Clutch for Reverse Motion, Steam Jacketed Bottom

# KUTZTOWN FOUNDRY & MACHINE COMPANY

INCORPORATED

## Founders and Machinists

1421 Chestnut Street

PHILADELPHIA, PA.

WORKS: KUTZTOWN, PA.

### PRODUCTS

#### Castings

Acid resistant	Kettle and Kiln
By-product Coke Oven	Machinery
Chemical	Nitrator
Condenser	Oven
Denitrator	Power Plant
Dryer	Preheater
Evaporator	Retort
Expansion Tank	Saturator
Filter Press	Semi-steel
Furnace	Sulphonator
Grey Iron	Tank
Heater	Vacuum Dryer
Incinerator	Vacuum Pan
Jacketed	Washer

#### Machinery

Garbage Reduction and Degreasing Plant  
Fertilizer and Waste Product Plant

### SERVICE

We build cast iron equipment to drawings and specifications, making such tests as may be necessary.

Equipment cast in more than one piece is assembled before shipment to insure accurate fit.

### PLANT

Our plant at Kutztown, Pa., consists of pattern shop, foundry, machine shop, storage sheds and yard, equipped with the most modern machinery for preparing moulds, machining and finishing castings, and the handling of heavy pieces from one part of the plant to another.

The foundry is equipped to handle castings of any shape and size up to 15 tons, poured in green or dry sand or loam moulds.

Castings up to 16 feet long and 16 feet in diameter can be finished in our machine shop which is equipped with suitable boring mills, lathes, planers, drills and other machinery.

### CASTINGS

Special attention is given to the mixture of the iron, which is controlled by analysis to secure a casting of the proper structure, suitable for the intended use.



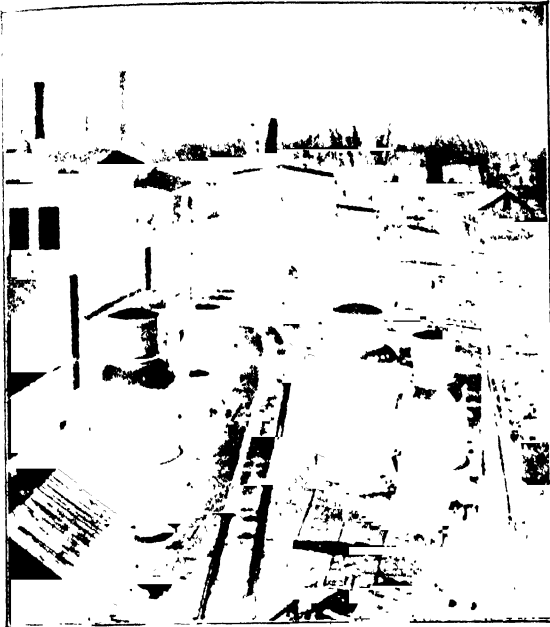
INTERIOR VIEW OF FOUNDRY



INTERIOR VIEW OF MACHINE SHOP

*Continued on Next Page*

The illustration below shows several evaporators in the erection yard. The crane in the background is lifting the top on one of them.



EVAPORATORS IN ERECTING YARD

Below is illustrated a 9' 6" condenser set up in the yard prior to shipment. Note assembly markings.



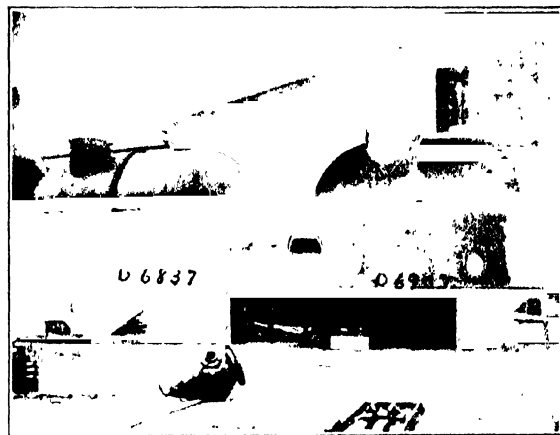
CONDENSER

A fair example of the large irregular castings we are equipped to pour, for power plant and industrial purposes, is shown in the following illustration.



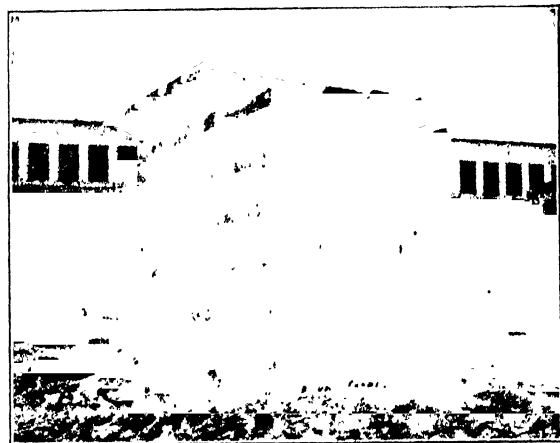
IRREGULAR CASTINGS

The two saturators shown in the next illustration are representative of castings produced by this company for use in the by-product coke industry.



SATURATORS

The stack of door frames shown is a good example of our facilities for quantity production.



DOOR FRAMES

# LACLEDE-CHRISTY CLAY PRODUCTS COMPANY

Refractories and Automatic Stokers

ST. LOUIS, MO.

BRANCH OFFICES

New York, N. Y., 59 East 42nd Street  
Pittsburgh, Pa., 901 Oliver Building

Detroit, Mich., 835 Book Building  
Chicago, Ill., 1366 Peoples Gas Building



Trade Mark

## PRODUCTS

Laclede-Christy Refractories for Industrial, Chemical, Metallurgical and Power Plant Purposes; Fire Brick and Suprafrax Brick in Standard and Special Shapes.

Settings for Stills, Autoclaves, Retorts, Acid Concentrators, Acid-proof Brick, Tile and Rings for packing acid-towers, Muffles, Dryers, Boilers, etc. Linings for Special Furnaces, Kilns, Dryers, Pulp Digestors, etc.

Vitrified Products (Sewer Pipe, Segment Blocks, Wall Coping, Hollow Tile, Flue Linings).

Furnaseal—Plastic Refractory Cement.

Laclede-Christy Chain Grate Stokers; Stowe Stoker; Laclede-Christy Flat Arches and Flat Arch Tile.

Archnu, a High Temperature Cement.

High Pressure Water Backs.

**LACLEDE  
FIRE BRICK**

## LACLEDE FIRE BRICK

We furnish Chemical analysis of any brands on request.

**Laclede-King Brick**—Made by the dry press process. Of even texture, contains no laminations, and its expansion and contraction at working temperatures is practically nil.

This quality prevents spalling or cracking, which recommends its use where sudden changes of temperature occur.

According to the specifications for fire brick set by the Bureau of Standards at Washington, Laclede-King brick ranks above the test required for High Heat Duty Brick, and we commonly style this brand "High Grade." The Government tests give cone 32 plus as the fusion point, which is about 3218°F.

**Laclede-Crown Brick**—A stiff mud process brick. Resists abrasion, destructive slagging action, and has remarkable load-bearing strength at high temperatures.

Ranks above the test required for High Heat Duty Brick according to specifications of the Bureau of Standards. The Government tests give cone 32 plus as the fusion point, which is about 3218°F.

**Laclede-St. Louis Brick**—Made by the dry press process. A most reliable brick for general furnace work. Of even texture, free from laminations, and its expansion and contraction at working temperatures is very low. It resists sudden changes of temperature well, and does not spall.

According to the specifications of the Bureau of Standards, Laclede-St. Louis Brick ranks above the test required for Intermediate Heat Duty Brick and we designate this brand as No. 1 grade. The Government tests give cone 29 plus as the fusion point, which is about 3100°F.

**Laclede-Christy-St. Louis Brick**—A stiff mud process brick, No. 1 Grade. Designed to resist abrasion and clinker action. For service where the fire brick are subjected to mechanical wear, this brand is particularly well adapted, due to its hard, dense nature.

According to specifications of the Bureau of Standards, this brand ranks above the test required for Intermediate Heat Duty Brick. The Government tests give the fusion point as cone 29 plus, which is about 3100°F.

Recent tests show the following compressions and contractions for "Laclede-St. Louis" and "Laclede-Christy-St. Louis" Fire Brick.

	Laclede-St. Louis Brick	Laclede-Christy- St. Louis Brick
Compression in 1350°C load test of 25 lbs. per sq. in.	53%	31%
Contraction after 5 hours at 1400°C.	36%	22%
Fusion Cone	30½	30%

**Laclede-Special-Crown Brick**—A hand-made brick of extra high quality. Very refractory, because of the unusually high proportion of Flint Clay. Its low initial porosity makes it resistant to slags and molten metal. Does not spall or crack under changing temperatures. Government Tests give cone 33½ as the fusion point, which is about 3272°F.

**Suprafrax Brick**—A hand-made, super-refractory, with an equal in the fire brick field. Alumina content of over 70% which tends to class it as a basic refractory, the Ceramists, however, define it as *neutral* in action.

Suprafrax has great strength, and it is the most refractory brick in the Laclede-Christy line. It ranks much higher than the test prescribed for High Heat Duty Brick, according to the specifications of the Bureau of Standards. In the Government tests the temperature of 1400°F. was reached without fusing this brick, and from tests made in our own and other laboratories the temperature of 3400°F. was shown to be below the fusion point.

## FURNASEAL

A wet plastic refractory cement, to replace fire clay or mortar for furnace brick work, either fire clay or silica. Can be used for the entire lining of small furnaces, furnace doors, ladles, etc. Also ideal for general repair purposes.

## SILICATE OF SODA FURNACES

As high temperatures are necessary in this melting process and severe fluxing action takes place during the operation, high grade refractories, such as Laclede-Christy make, should be used throughout. The designing, engineering and construction of the entire plant may well be left to the Russell Engineering Co., St. Louis, a subsidiary of Laclede-Christy.

## STOWE STOKER

This is a forced-draft type, whose fundamental principle is conveyor feed, positive in action from coal hopper to ash pit. These are a few compelling features:

(1) A single Stowe Stoker can be used for units up to 1500 h.p., thus doing away with the center furnace wall.

(2) The tuyeres are provided with graduated air spaces arranged to proportion the air correctly to the gradually varying requirements of the burning fuel bed. The design of the tuyeres is such that dripage is reduced to a negligible minimum.

(3) It is the only conveyor feed built on a divided incline and therefore excels in strong ignition temperatures.

(4) It is the only conveyor feed that holds the nearly spent fuel back on the grate until every bit of combustible is consumed.

(5) It does not form clinkers, and it positively and automatically discharges the ash from the furnace.



STOWE STOKER

## LACLEDE-CHRISTY CHAIN GRATE STOKER

This is a natural-draft stoker, for high volatile coals, representing the highest development of its type.

It is of the self-cleaning link pattern, of high quality construction and is installed with such capable engineering that the furnace stoker and draft facilities as a coal-burning unit leaves nothing to be desired in economy, capacity, flexibility, or labor expense.

## LACLEDE-CHRISTY FLAT ARCHES

Can be successfully used in any place where a crown or top is required for a hot furnace.

The design of the supporting structure of the arch is based on the multiple or sectional idea, which contributes to the strength and flexibility of the arch and makes possible the adoption of long arches.

We manufacture the tile as well as the iron work. We also carry in stock shapes of all other brands of tile. L-C Flat Arch Tile are made of absolutely dependable and always uniform materials.

## ARCHNU

This is a high temperature cement in dry form for repairing spalled or cracked furnace arches of every type. In addition to being the ideal cement for repairing arches, Archnu is adapted to laying up fire brick, patching furnace walls, patching ledge tile, etc.

# W. M. LALOR COMPANY

Apparatus for the Purification of Water for Drinking  
and Manufacturing Purposes

GENERAL SALES OFFICE

Continental and Commercial Bank Building  
CHICAGO, ILL.

FACTORY  
108 N. Jefferson St.,  
Chicago, Ill.

## PRODUCT

The Improved "Rochlitz" Automatic Water Still.

## DESCRIPTION

This is an apparatus for the purification of water by new methods, which effect a high degree of efficiency and cheapness of operation.

A combined condenser, purifier and aerator for producing a pure and palatable water for drinking and manufacturing purposes.

The Improved "Rochlitz" Automatic Water Still will furnish a steady stream of pure, distilled water free from carbonic acid and volatile impurities without any attention whatever as long as the gas or steam and water supply holds out.

The height of the dome is such that only pure, dry vapor can enter the condenser.

There are no parts to corrode, as it is constructed entirely of copper and brass, and lined throughout with purest block tin.

An ideal apparatus for—

Chemists	Laboratory Work
Assayers	Storage Batteries
Physicians	Residences
Druggists	Schools
Photographers	Hospitals
Perfumers	

and where absolutely pure water is essential and desirable.

The United States Government has purchased approximately one thousand "Rochlitz" Water Stills for service in this country and overseas.

"Rochlitz" Water Stills invariably exceed their rated capacity.

**Distinctive Features.** The remarkable efficiency of the "Rochlitz" Still is due to the following:

Scientific Construction of the Still

Asbestos Lined Apron

Type of Burners used

Cone Shaped Asbestos Lined Baffle

**Gas Operated Type**—Operates equally well with artificial or natural gas.

Delivers absolutely pure, cold aerated, distilled water at a cost of less than two cents per gallon on a basis of \$1.00 per M for gas.

Capacities  $\frac{1}{2}$  to 5 gallons per hour.



GAS OPERATED

**Gasoline or Kerosene Operated Type**—Equipment furnished includes Pressure Tank, Pump, Gage, Valves, Hollow Copper Tubing, Special Kerosene or Gasoline Burners, etc.

Our Kerosene and Gasoline Burners are powerful, wickless, odorless.

Capacities  $\frac{1}{2}$  to 5 gallons per hour.

**Steam Operated Type**—Attachable to any boiler. Costs little to install. Simple and effective to operate. Produces water at cost of  $\frac{1}{2}$  of one cent per gallon. Will purify water however bad. All impurities thrown down in boiler process are flushed out at apex at conical bottom of boiler chamber.

Capacities 1 to 20 gallons per hour.

**Electrically Operated Still**—Equipped with Bayonet Type Immersion Heaters.

The heater is easily cleaned because removable. Is highly efficient because all the heat must go into the liquid.

Heating units furnished for all standard voltages up to 250 volts; alternating or direct current.

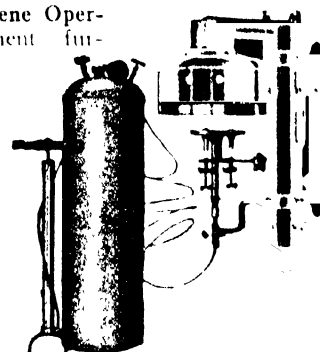
Control Switch and 6 feet of cord supplied.

Capacities,  $\frac{1}{2}$  to 5 gallons per hour.

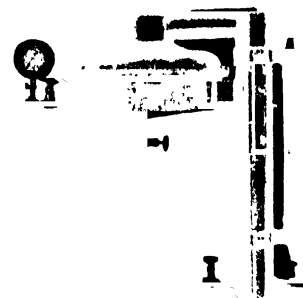
## GUARANTEE

We guarantee all material and workmanship entering into the construction of the Improved "Rochlitz" Automatic Water Still to be the best of its respective kind, and we will furnish new parts to replace any proving defective, within one year from date of sale, due to faulty material or workmanship.

**SEND FOR OUR BULLETIN ON STILLS**



GASOLINE OR KEROSENE OPERATED



STEAM OPERATED TYPE



ELECTRICALLY OPERATED STILL

# LANCASTER IRON WORKS

Tanks and Steel Plate Construction

LANCASTER, PA.

NEW YORK OFFICE 501 Fifth Avenue

Incorporated 1910

## PRODUCTS

### Steel Plate Products

#### Tanks

Acid	Jacketed
Air	Knocked-down
Blow-off	Mixing
Car	Molasses
Chemical	Oil Storage
Condenser	Pressure
Dipping	Rectangular
Expansion	Rendering
Filtering	Settling
Field Storage	Soap Factory
Galvanizing	Storage
Gasoline	Tar
Grain	Turpentine
Hot-Water	Vacuum
Hydro-Pneumatic	Varnish

### Chemical Apparatus and Special Machinery

Accumulators	Kilns
Acid Eggs	Nitrators
Agitators	Purifiers
Autoclaves	Reducers
Benzol Washers	Retorts
Condensers	Rotary Dryers
Cooling Towers	Rotary Filters
Crystallizers	Stills
Digestors	Sulphonators
Evaporators	Vats
Fusion Pots	Vulcanizers
Kettles	Washers

### Pipe

Straight Riveted Pipe  
(for any purpose or pressure)  
Hydraulic Mains  
Land Pipe (for dredging)  
Pontoon Pipe (for dredging)  
Steel Pontoons  
Dredge Pipe Accessories  
Ball Joints, Gate Valves, Y's, etc.

### Stacks and Breechings

#### Field Storage Tanks

#### All kinds of Steel Plate Work

Built and Erected by Our Own Crews.

## LANCASTER ERECTING CREWS

Each piece of work erected by us is put up by our own crews. These erecting crews are an integral part of our organization and their work is the final factor in the complete service we put at the disposal of our

customers. Each job we undertake is guaranteed to be completed to our customer's entire satisfaction.

## ORGANIZATION

Every man in the organization of the Lancaster Iron Works is individually interested in the success of the company. Every man is an expert in his line. The personality of the business has grown from one man, who willed that it must succeed to twelve directing heads who have the same determination. The friendliness and cooperation existing between the officers and men of this company is insurance to our customers that there will be no strikes or disagreements to hold up their work.

## SHOPS

Plate	Machine
Pattern	Foundry

The Lancaster Plant is composed of the above four units. This is an unusual combination and permits us to take any Steel Plate Construction order and do all the work in our own shops. In this way we know the work is done right as we control all the factors which affect production. It means that your order will not be split up and parceled out to three or four different concerns. We are equipped to turn out 25,000 tons of fabricated steel plate per year.

## RESOURCES—RESPONSIBILITY

Today, when big work is to be given out, Engineers and Purchasing Departments scrutinize first the responsibility of the concerns bidding, and secondly the price. A bid too low carries its own danger signal.

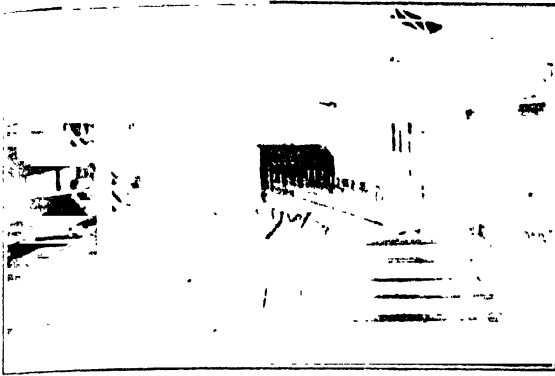
The financial standing of the Lancaster Iron Works is such that we are able to handle any size undertaking. Our equipment and location enable us to turn out work promptly and satisfactorily.

## LANCASTER SERVICE

The Lancaster Iron Works puts at the disposal of every customer and prospective customer a trained and experienced Engineering staff skilled in the design and construction of steel plate work. The cumulative experience gained by the men of our organization through their years of experience is built into every piece of Lancaster equipment and is at the disposal of any one calling upon us.

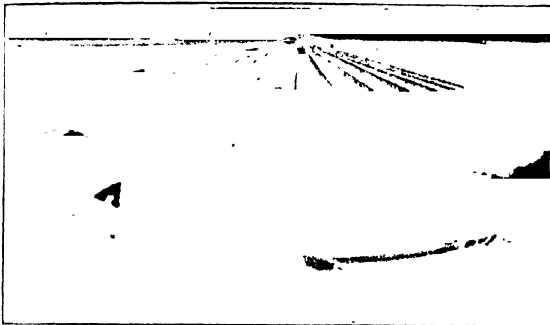
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**INTERIOR VIEW OF SHOPS, SHOWING SHIPMENT OF LANCASTER RIVETED STEEL PIPE**

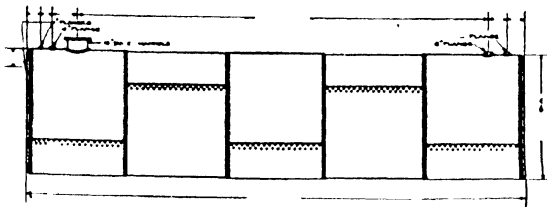
Riveted steel pipe, for any purpose and pressure, varying from 12 inches in diameter up, of any desired length or thickness is manufactured by us. Lancaster dredge pipe is used along the whole coast from Boston to Galveston.



**STANDARD FIELD STORAGE TANK**

The standard field storage tanks carried in stock by us range in size from 355 barrels to 55,000 barrels. We are in a position to ship any size tank on short notice.

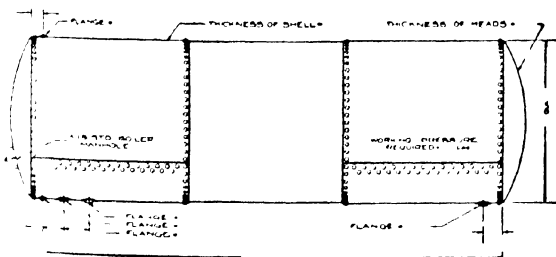
See the Lancaster Tank Bulletin



**HORIZONTAL OIL STORAGE TANK, WITH FLAT HEAD**

Horizontal storage tanks ranging in size from 1,000 gallons to 25,000 gallons are carried in stock for quick delivery.

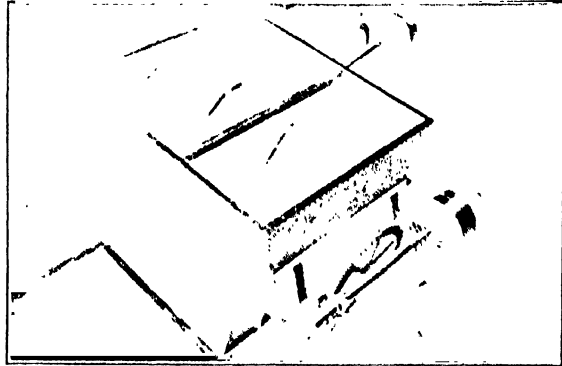
See the Lancaster Tank Bulletin



**PRESSURE TANK**

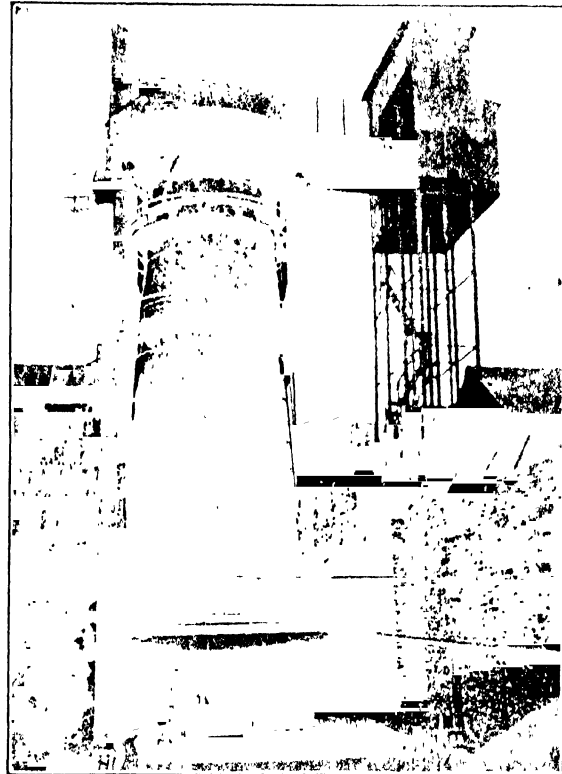
Pressure tanks ranging from 24 inches in diameter by 5 feet in length, to 10 feet in diameter by 40 feet in length are carried in stock for immediate shipment.

See the Lancaster Tank Bulletin



**SPECIAL MIXING APPARATUS, SHOWING INTERIOR WITH CURVED BLADES**

This special mixing apparatus shows a piece of work which required the highest type of workmanship. Note the curved knives.

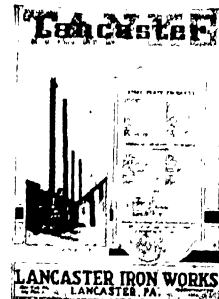


**SPECIAL RIVETED STEEL CUPOLA, WITH BRACING, LADDERS, DECKS, FRAMEWORK, ETC., COMPLETE**

Here is a steel cupola designed by the Lancaster Engineering Department, fabricated in the Lancaster shops and erected by a Lancaster erecting crew. It shows the intricate work we are equipped to handle.

## LANCASTER TANK BULLETIN

This is the new Lancaster Tank Bulletin. It contains a list of the equipment manufactured by us and detailed specifications of the various tanks which we carry in stock.



# LAMMERT & MANN CO.

Manufacturers of Rotary Vacuum Pumps; Engineers and Machinists

Walnut and Wood Streets

CHICAGO, ILL.

Telephone  
WEST 1918

## PRODUCTS

**Lammert Rotary Vacuum Pumps**, Air and Water Cooled, for any high, dry vacuum service and pressure up to 25 lbs.

**Lammert Pressure Pumps**.

**Water Cooled Rotary Blowers**.



Trade mark

The large pumps are equipped with automatic oilers which deliver a constant flow of oil to the internal mechanism through the bearings, air which the oil is separated from the exhaust air and returned to the oil chamber to be used over and over again. This feature not only reduces the operating cost, but also cuts the attention required to the minimum.

The smaller pumps may also be equipped with the automatic oiling feature, if desired.

## ADVANTAGES

There are no valves to stick, no pistons to wear, no cranks or connecting rods to complicate the working parts and consume power.

Lammert pumps are simple, compact and require little floor space.

They are quiet running without vibration. All parts are standard and interchangeable and each part is rigidly inspected and every pump is tested to its full rated capacity.

Every Lammert pump carries a full guarantee against faulty workmanship or material.

## TYPES AND RELATIVE VACUUM RATINGS

Lammert pumps may be had air or water cooled, belt or motor driven. The air cooled pumps are designed for intermittent service and will develop a 26-in vacuum at sea level. The water cooled types are for continuous duty and will easily maintain a 27½-in vacuum at sea level.

The two-stage, high duty vacuum pumps are guaranteed to maintain a vacuum within ½ in. of the barometer and can be made to do within 1/10 in.

For special requirements various arrangements can be made to accomplish the desired result, such as "unit combination vacuum and pressure," etc.

Send for Catalog No. VPB-126.

## LAMMERT PUMPS

Lammert rotary dry vacuum and pressure pumps are made in a variety of types and sizes to meet the numerous service requirements.

For the past twenty years Lammert & Mann Co. have been making vacuum pumps and some of the largest concerns in America are using them with absolute satisfaction. They have demonstrated by actual on-the-job performance their superior adaptability in meeting the exacting requirements of the work for which they were designed.

## WIDE RANGE OF USES

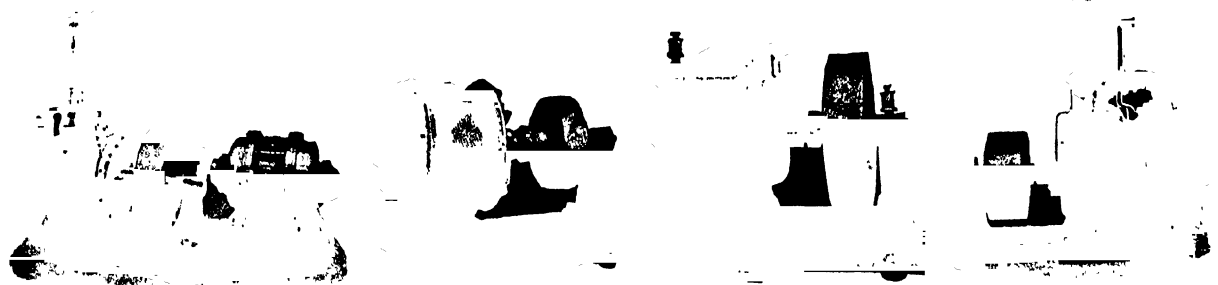
**Lammert Vacuum Pumps**—Used for canning, preserving, milking, in chemical laboratories and for many varied special purposes where high, dry vacuum is required.

They are also adapted to the priming of centrifugal pumps, for which we have our automatic control.

**Lammert Pressure Pumps**—Used for agitating liquids, cleaning generators, for machine shops, and any service where pressure up to 25 lbs. can be used.

## DISTINCTIVE FEATURES

Lammert pumps are dependable, economical and require the absolute minimum of attention. The oiling systems are flawless. The air cooled and small water cooled pumps are equipped with the capillary type of oiling—oil fed to the bearings and all moving parts by capillary attraction—very economical and efficient.



**MOTOR DRIVEN TYPE**  
For continuous duty. Equipped with automatic oiler.

**AIR COOLED BELTED TYPE**  
For intermittent service. Capillary oiling.

**WATER COOLED BELTED TYPE**  
For continuous service. Capillary oiling.

**TWO-STAGE BELTED TYPE**  
Equipped with automatic oiler. Highest vacuum.

## LAMMERT PUMPS

	Water cooled, single stage, belt driven For 27 in. vacuum at sea level										Air cooled, single stage, belt driven				Water cooled, single stage, belt driven capillary oiling				Water cooled, double stage, belt driven high duty			
No.	5	6	7	8	9	10	11	12	13	14	1	2	3	4	1	2	3	4	1A	4A	5½A	6A
Capacity, cu. ft. per min.	55	67	90	180	275	425	700	3½	7	14	3½	7	14	24½	3½	7	14	24½	3½	24½	67	90
R. p. m.	300	300	230	185	150	120	95	500	450	400	350	500	450	400	350	500	450	400	350	500	300	230
Pulley, in.	14x4	14x4½	16x6	24x7	28x10	34x12	46x14	4x2	6x2	9x2	10x3	4x2	6x2	9x2	10x3	4x2	6x2	9x2	10x3	4x1½	10x3	14x4½
Inlet and outlet, pipe size, in.	2	2	2½	3	3½	4	5	¾	¾	1	1½	¾	¾	1	1½	¾	¾	1	1½	¾	¾	2
Horsepower	4½	5½	6½	12	18	28	40	¾	¾	1½	2	¾	¾	1½	2	¾	¾	1½	2	¾	7	9½
Floor space, in.	17x28	17x30	22x37	26x48	35x61	43x76	55x97	6x11	10x15	11x17	12x20	6x11	10x15	11x17	12x20	6x11	10x15	11x17	12x20	6x14	12x27	17x42
Shipping weight, domestic, lbs.	525	575	1000	1600	3500	6500	10800	26	80	90	170	29	85	100	185	45	245	280	1200	2000	22x50	22x50
Shipping weight, export, lbs.	650	725	1250	1950	3950	7050	11450	36	100	120	200	39	105	130	215	60	280	280	1200	2000	22x50	22x50

# JOHN G. LAPHAM ENGINEERING CO., Inc.

Carbonic Safety System of Ice-Making and  
REFRIGERATION

General Eastern Agent of the American Carbonic Machinery Co.

30 Church Street  
NEW YORK, N. Y.



**PRODUCTS: Refrigerating Machinery for all Industrial Chemical Uses.**

All our Installations use the (CO<sub>2</sub>) Carbonic Safety System.

## ADVANTAGES OF THE CARBONIC SAFETY SYSTEM OF REFRIGERATION:

Briefly the chief advantages of the Carbonic Safety System of Refrigeration are:

- 1 Absolute freedom from explosive and suffocating gases.
- 2 Low cost of operation.
- 3 Extremely low limit of temperatures.
- 4 No offensive odors or gases to endanger life or attack metals or destroy perishable goods.

## SPECIAL REFRIGERATING PLANTS FOR:

Explosives and Dyestuff Manufacture.  
Crystallizing Chemicals.  
Chilling Oils and Cooling Liquors.  
Low Temperature Drying.  
Solvent Recovery.  
Liquefying Gases.

## DIAGRAM EXPLANATION:

Illustrated here is a complete refrigerating plant showing the relation and connections between the three distinct stages of any compression system: First, the compression (compressor A); second, the condensing (condenser B); and third, the expansion (expansion coils C). After the expansion stage the cycle is repeated.

The plant when new is charged with carbon dioxide, which is obtained in standard steel containers or drums. In these drums it is under pressure and will flow into the system by making a small pipe connection (H) between a valved opening in the suction pipe leading to the compressor and a drum of carbon dioxide.

After the plant is charged the gas confined in the system is circulated from the compressor (A) through the gas channel of the condenser (B) into the liquid receiver, from where it flows to the expansion valve (D) into the expansion coils (C) and then back to the compressor (A).

Cold water is supplied to the water tubes of the condenser, which cools the heated gas, condensing and also liquefying it. This cooled and condensed gas is collected in a liquid receiver from where it flows to the expansion valve (D) into the expansion coils (C), where the pressure is reduced by adjustment of the expansion valve. The expansion of the gas in the expansion coils (C) also reduces the temperature of the gas to a very low degree, which reduces the temperature of the air or substance in contact with the outer surface of the expansion coils, which surface may be installed directly in the refrigerator as shown, in a brine tank where calcium chloride brine is used as a transfer cooling medium, in drinking water, or for any purpose for which the refrigerating plant is to be used.

After the gas passes through the expansion coils it flows to the compressor under a low pressure and low temperature. It is again compressed by the compressor and discharged into the condenser.

Since it is necessary to maintain different pressures in the various parts of the system, gauges as shown on the Gauge Board (C) are provided to indicate the conditions of the gas and permit the operator to have the system under his control.

Any excessive oil supplied to the compressor for lubricating the cylinder is collected by oil traps (E) and (G) where the oil is drawn off through the drain cocks. The compressor is driven by any suitable motive power, either from a separate unit or driven from a line shaft.

## SIMPLICITY OF OPERATION:

The Carbonic Safety System is very simple in its operation, and is unlike other compression refrigerating equipments inasmuch as it is not required to manipulate any valves other than those controlling the condensing water.

Many chemical plants, breweries, hospitals, hotels, merchant marine and battle ships are using our machine because of its non-explosive, odorless features and simplicity of operation and control. We are always pleased to furnish catalog and detailed information on request.

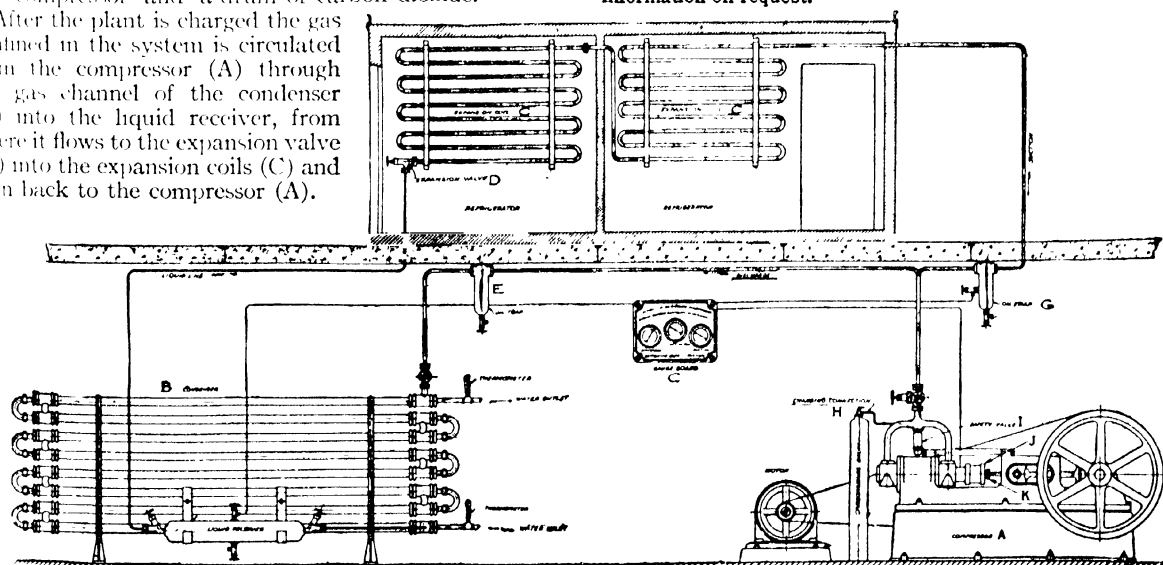


Diagram Showing Connections of a Carbonic Safety Refrigerating Plant with Direct Expansion Coils Placed in Refrigerators

# LASKER IRON WORKS

Engineers, Fabricators, Erectors Steel Plate Construction  
3201-3229 S. LINCOLN STREET, CHICAGO, ILLINOIS

Telephone LAFAYETTE 3700 - 3701

## PRODUCTS

Light and Heavy Steel Plate Construction and  
Tanks for:  
Smelters  
Steel Rolling Mills  
Oil Refineries  
Sugar Refineries  
Paper Mills  
Hydraulic Power Plants  
Acid and Chemical Plants

## EXPERIENCE

Lasker products are based on thirty years' intensive experience, plus modern equipment.

On this firm foundation we have built our name and reputation.

The maintenance of these things necessitates that they be protected and extended with every order filled.

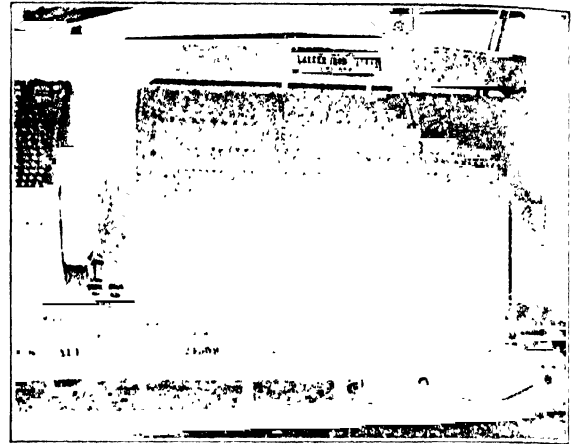
Customers are saved annoyances, delays, worry and money through this source.

It means that the installation of the sturdy, economical Lasker Steel Products brings results in service, economy and satisfaction.

## SERVICE

We are prepared to erect special steel plate work of any kind wherever you may be located.

As engineers, fabricators and erectors, we specialize in steel plate construction, for smelters and steel rolling mills, stills and oil refinery equipment, also hydraulic power plants, acid and chemical plants, pack-



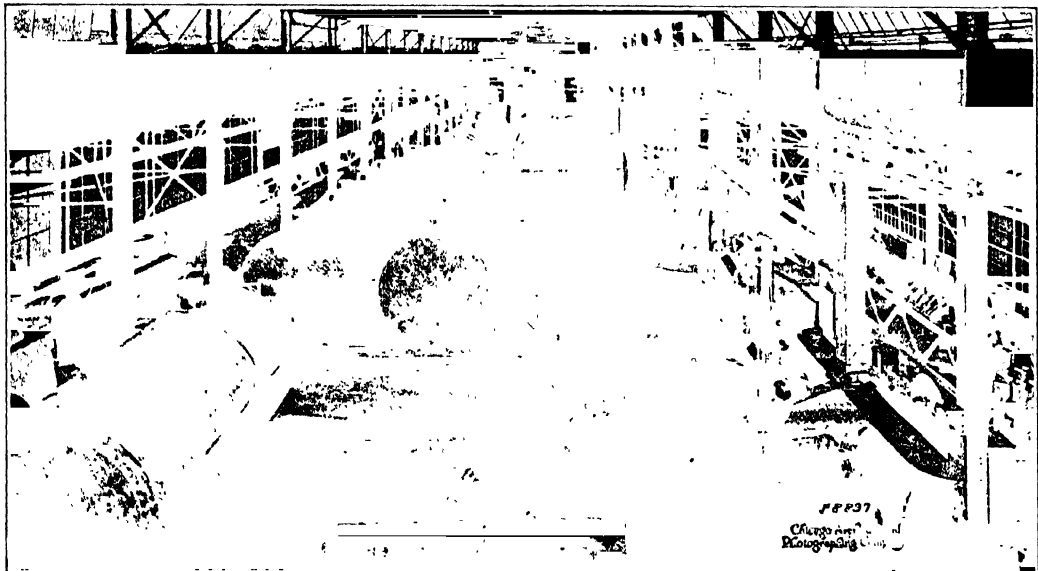
ROTARY DIP TANK AND WASHER

ing houses, soap works, power plants and making of tanks for any storage use.

The scope of our operations on work of this nature covering, as they do, practically the whole United States, makes our service available to concerns everywhere who appreciate quality. Large stocks permit prompt action.

## PRICES

On receipt of specifications covering your needs, we will immediately prepare and submit quotation which will prove the economy of Lasker methods and efficiency.



STILLS UNDER CONSTRUCTION

# ROBERT L. LATIMER & COMPANY

PHILADELPHIA BRANCH OF THE CHAIN BELT COMPANY  
24 AND 26 NORTH FRONT ST., PHILADELPHIA, PA.

## PRODUCTS

Conveyors and Elevators for the economical handling of Chemicals, Fertilizers, Coal, Ashes, Stone, Sand and other material.

Manufacturers and designers of the Rex Traveling Water Screens, for the cleaning of intake water used in Power plants and other purposes.

Manufacturers and dealers of Rex Chain Belting, Sprocket Wheels, Elevator Buckets and Screw Conveyor. Gears, Clutches, Pulleys, Hangers, Bearings, Couplings, Collars and other Power Transmitting appliances.

Dealers in Leather, Rubber, Cotton and Canvas Belting for the transmission of power and conveying purposes.

Dealers in Old Anchor Brand Swiss Silk Bolting Cloth and Grit Gauze, used in the bolting and grading of Chemicals, Flour, Sugar, Starch, Snuff, Soap-stone, Talc, Emery and other material.

Wire Cloth of Brass, Copper, Phosphor Bronze and Steel. Perforated Metal for Grading and Cleaning purposes.

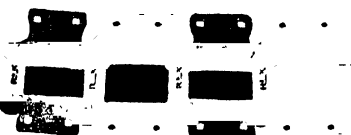
## REX CHAIN

Trade Mark



### REX DETACHABLE CHAIN

A distinct field where a stronger and more expensive chain would not be permitted. Links changed in a few seconds.



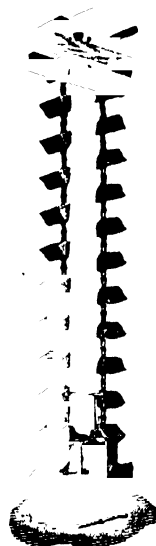
### REX COMBINATION CHAIN

Has great strength and wearing qualities. Used in cement mills, fertilizer plants, etc.



### REX GRIPLOCK CHAIN (RIVETED)

For driving and elevating work, especially adapted for heavy service. We can also furnish this chain riveted, pin and cotters or riveted. Some numbers of this chain will run on standard numbers of detachable chain sprocket wheels.

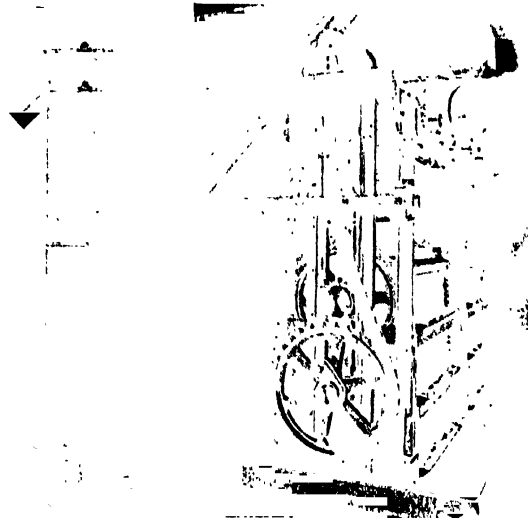


SINGLE STRAND TYPE ELEVATOR



### BEVEL GEARS

All kinds of spur, bevel, miter and worm gearing.



### REX STEEL ELEVATOR CASING

Of the most approved design. Furnished in every description.

### BOLTING CLOTH AND GRIT GAUZE

Latimer's Celebrated Improved Old Anchor Bolting Cloth and Grit Gauze is made from the finest quality of selected raw silk, with the most careful workmanship. The threads are tightly twisted. It is uniform in meshes, exact and full count. It is free from fuzz, and of extra strength, thus guaranteeing the most durable cloth which it is possible to manufacture and insuring the most uniform product in grading all kinds of material.

### WIRE CLOTH

We supply wire cloth for use by the various chemical industries of whatever material and size of wire may be desired to meet special conditions.

### PERFORATED METALS

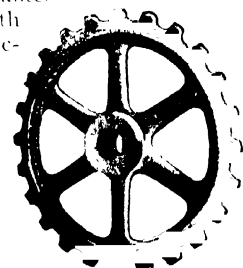
Our factory is fully equipped with the latest and most improved machinery and dies for perforating metals of all kinds, and are prepared to furnish any size or style of perforation that may be required.

### REX TRAVELING WATER SCREEN

Designed to remove foreign material from water. Removes refuse from water to be used in production of steam power or for industrial purposes requiring a large supply of clean water. Also for removing by-products from water for reclamation or to prevent contamination of waterways.



BOLTING CLOTH TRADE MARK



### SPROCKET WHEELS

Made of high grade refined iron. Also furnished in semi-steel, cast steel and chilled in which teeth and rim are tempered to an exceeding hardness, leaving the hub of tough cast iron, easily bored and machined.



### STANDARD STEEL SCREW CONVEYOR

Furnished in standard and special lengths, from 4 to 18 in. in diameter. Also furnished in brass or copper for use in chemical works, tanneries, etc.



# LEBANON BOILER WORKS

J. K. Petty & Co., Inc., Proprietors

MAIN OFFICE—6 S. 15TH STREET, PHILADELPHIA, PA.

Selling Representatives in the Principal Cities and Foreign Countries

WORKS  
Lebanon

## PRODUCTS

Designers, Manufacturers and Erectors of Boilers, Superheaters, and General Plate Work.

### UNIFLOW HIGH EFFICIENCY BOILER

This modern Return Tubular Boiler is patented in U. S. and Foreign Countries. Authoritative records show that after more than 50 years of universal service there are many more return tubular boilers being made for steam power purposes than any other type of boiler. It has stonically overcome all kinds of abuse

### UNIFLOW RETURN TUBULAR (Circulating) vs. OLD RETURN TUBULAR (Contraflow)

A 60 in. x 18 ft. Uniflow Boiler, while working easier, will develop more horsepower than a 72 in. x 18 ft. Old Return Tubular.

The two Uniflows shown in Fig. 1 have more capacity than three Old Return Tubular Boilers of the same dimensions. The space left over is reserved for a future Uniflow, although it could be otherwise utilized.

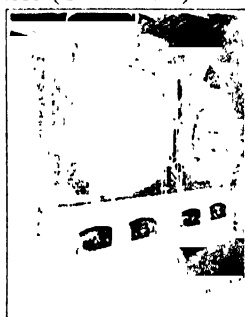


FIG. 1

While maintaining the same simplicity of construction and all of the other natural and noteworthy advantages of the time honored Return Tubular type of boiler, the Uniflow, augmented with its Positive Circulation, secures more H.P. and forges way ahead in compactness, responsiveness, overload capacity, dry steaming, constant water level, efficiency, consistent design, range of sizes and adaptability—all with lower installation, maintenance and operating costs.

All Uniflow Boilers operate at 74% or higher efficiency continuously. Old Return Tubular Boilers average 57% (U. S. Government reports)

Uniflow Tubes are 1 1/4" apart—Old Return Tubulars are 1" apart

A nozzle for each tube keeps the Uniflow heating surface clean (Fig. 2)

One prominent Uniflow user (a College) writes:—

"Your Uniflow setting has proved to be all that you claimed for it. It is air-tight, no cracks have appeared and it is in as good shape as when first installed, despite some hard usage which the boilers have received."

### HORSEPOWER RATING OF UNIFLOW BOILERS

Boiler No.	Horsepower	Boiler Dimensions Dia. Len.	No. of Tubes	Boiler No.	Horsepower	Boiler Dimensions Dia. Len.	No. of Tubes
*A 1	134	60" 16'0"	96	B 3	50	36" 14'0"	47
*A 2	151	60" 18'0"	96	B 6	67	42" 14'0"	64
*A 3	155	66" 16'0"	111	B 9	75	48" 14'0"	71
*A 4	174	66" 18'0"	111	*B 12	102	54" 14'0"	100
A-5	193	66" 20'0"	111	*B-15	123	60" 14'0"	121
A 6	192	72" 16'0"	140	*B-18	153	66" 14'0"	152
*A 7	216	72" 18'0"	140	*B-21	181	72" 14'0"	181
A 8	210	72" 20'0"	110	B-24	214	78" 14'0"	216
A 9	210	78" 16'0"	169	B 27	267	84" 14'0"	272
*A 10	259	78" 18'0"	169				
A 11	287	78" 20'0"	169				
*A 12	313	84" 18'0"	206				
A-13	317	84" 20'0"	206				
A 14	356	90" 18'0"	256				
A 15	428	90" 20'0"	256				
A-16	410	98" 18'0"	293				
A-17	488	98" 20'0"	293				



FIG. 2

\* Denotes stock sizes, 150 lb. working pressure, A S M E, Special Other sizes built special

50% overload capacity guaranteed.

## UNIFLOW RETURN TUBULAR VERSUS WATER TUBE BOILERS

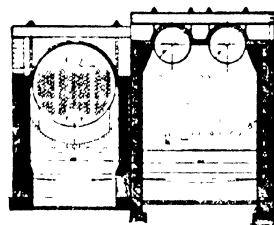


FIG. 3

313 HP  
Standard  
Uniflow  
Boiler

300 HP  
Standard  
Water Tube  
Boiler

Uniflow Return Tubular Boilers are much safer than Water Tube Boilers and contrary claims misrepresent recorded facts. No multiple-ring, butt-strapped Return Tubular Boiler has ever been known to explode, as have Water Tube Boilers by the hundreds.

Uniflow Boilers cost less per horsepower installed, are cheaper and easier to operate and require much less floor space.

Uniflow Boilers excel in plain, rugged construction, accessibility for cleaning and repairs, compactness (Fig. 3) and adaptability.

Uniflow circulation is twice its height. Water Tube circulation is twice its height, plus twice its length. Uniflow Boilers are more responsive, maintain a constant water level, do not prime and have no soot losses.

The outside of water tubes foul with soot and fire scale (Fig. 4) which can never be effectively cleaned off. Consequently Water Tube Boilers test 71 to 74% efficient when new—but after a year's service they operate at from 48 to 65%, due to unavoidable soot losses.

Another well-known thoroughgoing Uniflow user (a Steel Works) writes:—

"We have a 500-horsepower Water Tube Boiler whose full capacity is 3 steam hammers, while our 313 horsepower Uniflow's capacity is 4 steam hammers"



FIG. 4 (A very mild case)

## UNIFLOW PERFORMANCE IS GUARANTEED

Uniflow saves from 15 to 25% in fuel over both Old Return Tubular and Water Tube Boilers for every year of operation after the first year. Uniflow installations comprehend high efficiency boilers—high efficiency furnaces—smokeless combustion—air-tight settings. They are well adapted to superheating.

The Uniflow stack is designed to last as long as the boiler. It is made self-supporting or guyed and requires no additional floor space.

Uniflow is a simple, standardized design, meeting all conditions of installation, such as low head room; any kind of breeching take-off, side and rear alleys not essential, etc.—but always there is more horsepower, maximum sustained economy for the life of the installation—least maintenance and lower first cost in Uniflow—The Modern Boiler.

**WHY NOT PUT YOUR BOILER PROPOSITION UP TO US?**

# LEEDS & NORTHRUP COMPANY

Electrical Measuring Instruments

4901 STENTON AVENUE, PHILADELPHIA, PA.

1304 MONADNOCK BLOCK, CHICAGO

## PRODUCTS

Scientific electrical measuring instruments, including: galvanometers; resistance, current and potential measuring instruments; potentiometers; hydrogen ion concentration apparatus; electrolytic conductivity apparatus; indicating, recording, signalling and controlling pyrometers of the potentiometer type; optical pyrometers; etc.

## POTENTIOMETER PYROMETERS

The potentiometer pyrometer embodies the principles of the precision potentiometer in a form suitable for industrial use. It is free from all errors due to resistance of couples or lead wire, and errors due to the cold junction temperature. Ranges up to 2000° F. for base metal couples, and 3000° F. for noble metal couples. If the instrument is calibrated in millivolts, it may be used with any type of thermocouple irrespective of the length or cross-section of the thermocouple wires. The accuracy is guaranteed to  $\frac{1}{2}\%$  of the range.

**Indicating**—The portable type indicating potentiometer measures  $9\frac{1}{2}'' \times 6'' \times 6''$  and weighs 9 lbs. It is well suited for use as a checking instrument and for any special or investigational work.

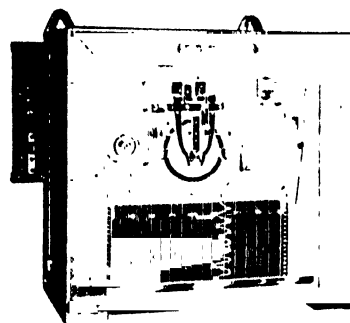
The wall type indicating potentiometer, for permanent installation, is contained in a cast brass dust-proof case, either dull black or nickel plate finish. A selector switch may be used with these instruments when measuring several couples from the same station.

**Recording**—The recording potentiometer is a rugged machine driven by an electric motor. Motors furnished for 110 volts A. C. or D. C., or 220 volts D. C. The chart is 10 inches wide, giving a clear open scale, and moves forward at the rate of 3 inches per hour. The recorder permits the attachment of contact making mechanisms so that it will give automatic signals, or will control automatically.



INDICATING POTENTIOMETER

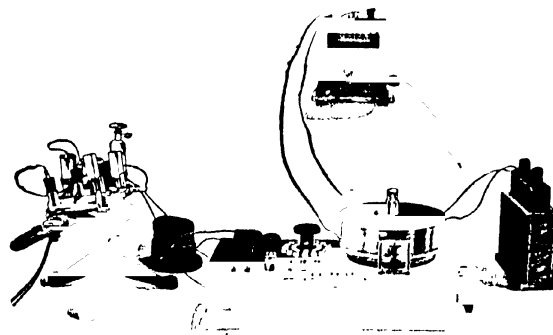
**For Hydrogen Ion Measurements**—Four equipments are available: (1) the type K potentiometer equipment for research and laboratory work requiring the highest precision of measurement; (2) a less expensive equipment for general laboratory work and process control; (3) portable hydrogen ion potentiometer, similar in appearance to the indicator shown on this page; (4) the hydrogen ion recorder, similar to the recorder shown, which gives continuous indications and which will operate alarm or signalling devices.



RECORDING POTENTIOMETER

**For Conductivity Measurements**—Six equipments are available: (1) a precision equipment with which measurements can be made to .001%; (2) a less elaborate equipment for general laboratory work; (3) an equipment for general laboratory work which can be operated on an A. C. lighting circuit; (4) a portable conductivity bridge also operated on a lighting circuit; (5) an indicator to mount on the wall, which can be used with a selector switch to measure conductivity at several different points; (6) the conductivity recorder, which resembles the recorder shown.

**Types of Installation**—Hydrogen ion equipments have been employed in connection with the carbonization of beet sugar juice, the neutralization of glucose liquors, the fermentation of molasses, the tanning of leather, the chemical treatment of textiles, and others involving knowledge regarding the acidity or alkalinity of solutions; while the conductivity equipments have been used in measuring boiler water concentrations, detecting surface condenser leakage and tail race losses, determining the time to finish the condensation of milk, measuring the concentration of acidity, and others in which knowledge of change in chemical condition is essential.



TYPE K POTENTIOMETER EQUIPMENT FOR H-ION DETERMINATIONS

## PHYSICO-CHEMICAL METHODS IN INDUSTRY

Measurement of hydrogen ion concentration and measurement of electrolytic conductivity are two methods of physical chemistry which have come into general use in connection with the control of industrial processes which depend upon a knowledge of the chemical composition of liquids containing substances in solution. The Leeds and Northrup line of apparatus embraces several types of equipments for the application of these methods.

## LEWIS, GREEN, McADAMS AND KNOWLAND

Chemical Engineers

66 BROADWAY, CAMBRIDGE, MASS.

### OUR SERVICE SUPPLEMENTS THE CLIENT'S FACILITIES

We are equipped to conduct necessary research work for developing new and improved processes, and then to furnish specifications and design plant and equipment for carrying on such processes on a commercial scale. Where our clients have plant laboratories, we work with or direct work on any special problem in their own laboratory, or carry it on in our laboratory as may be desired.

### MANY CLIENTS OUTSIDE OF CHEMICAL FIELD

Our work is largely with manufacturers whose business is not essentially chemical, but in whose processes we have been able to reduce or recover wastes, make possible a greater uniformity of product, or to lower the losses due to rejections. We have often been able to cooperate in the commercial development of ideas put forward by the manufacturer's organization.

### EXCLUSIVE POLICY A SAFEGUARD TO THE MANUFACTURER

Only one retaining client in any given line will be accepted by this firm. Thus, we are able to establish the confidential relation that must exist for the best results, and at the same time be sure that no information will leak to competitors. The whole strength of our diversified organization is at all times available to the client, with no divided allegiances or delicate situations, such as are bound to arise where such a strict rule is not followed.

### REFERENCE TO ACTIVE CLIENTS

We are prepared to undertake any work in the general scope of chemical engineering and our ex-

perience has included the lines mentioned below. We shall be pleased to refer those interested in the nature and quality of our work to clients who can inform them at first hand as to the satisfaction they have had with our service.

### SPECIALIZED EXPERIENCE IN THE FOLLOWING LINES

The following are indicative of undertakings in which we have rendered service.

The technical development of a nationally advertised automobile brake-lining from the raw material to the finished product.

A process for flash-proofing cotton fabrics, which removed a fire risk which was a serious drawback to their sale and use.

The drying of food products to prevent deterioration losses due to uncontrolled reduction of their moisture content.

The tunnel drying of sole leather.

A process for dyeing oil-tanned leather, without the use of dusts as employed in all processes hitherto.

Installation of equipment preventing losses of valuable solvents.

Design and erection of special dust collecting apparatus.

The design of many types of special purpose driers, and their installation and tuning up for maximum efficiency.

The inspection of municipal water supply and public utility systems.

The introduction of methods for producing extra heavy, but controlled, impregnation of roofing materials with asphaltic mixtures.

Engineering reports to financial interests in regard to firms in which they are concerned. Reports on possibilities of new projects.



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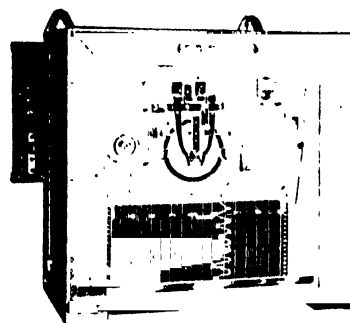
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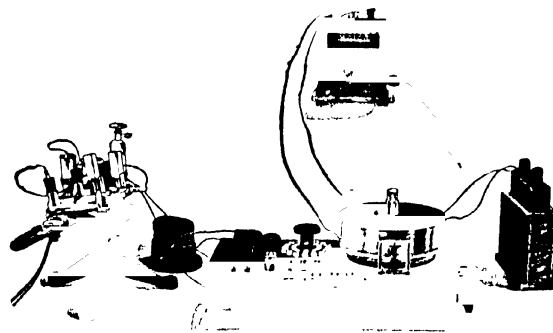
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# LIBERTY COPPERSMITHING CO.

Coppersmithing Engineers

1708-16 North Howard Street

PHILADELPHIA, PA.

NEW YORK OFFICE  
10 HUNTER ST.

PLANT  
1708-16 N. Howard St.  
1709-17 Waterboro St.  
Philadelphia, Pa.

## PRODUCTS

Of Copper, Aluminum, Brass, Iron, Steel, Silver, Monel Metal or Lead.

Autoclaves	Milk Evaporators
Alcohol Apparatus	Pans, Vacuum
Aluminum Linings	Pressure Kettles
Block Tin Linings	Revolving Pans
Coils, All Kinds	Separators
Coolers and Heaters	Still
Condensers	Vacuum
Clarifiers	Pressure
Copper Pipe Lines	Continuous
Defecators	Rectifying
Evaporators	Fractionating
Extractors	Silver Linings
Extracting Batteries	Tanks
Heat Exchangers	Copper
Jacket Kettles	Brass
Kettles	Monel Metal
Lead Linings	Mixers

We manufacture special or standard apparatus to clients' specifications for the following plants:

Breweries	Edible Oil	Pharmaceutical
Chemical	Food Products	Paper and Sulphite
Candy	Logwood	Sugar Houses
Dye	Malt Extract	Tanneries
Distilleries	Milk Condenseries	Vinegar

## FACILITIES

The fact that the organization is composed of master coppersmiths and all castings are carefully machined to gauge enables us to build to advantage any of the above equipment in our own shops, insuring proper fit and workmanship, as all parts and machines are erected and piece marked and thoroughly inspected before leaving our plant.

## SERVICE

From the long experience of years of the members of the company and their organization in building all types of chemical equipment they will be pleased to assist in the design when fundamental errors have been detected and cooperate with their clients that the apparatus may be executed more economically.

## INQUIRIES

We solicit your inquiries and will be pleased to furnish quotations, specifications and drawings upon request.



ONE END OF FIRE SHOP SHOWING POWER PLANT, BENDING MACHINE AND POWER HAMMER



PORTION OF COILS FOR 13 FT. DIAM. COIL PAN IN PROCESS OF ASSEMBLY

# LINK-BELT COMPANY

Manufacturers of

**Elevating, Conveying and Power Transmission Machinery  
and Accessories**

## PHILADELPHIA

New York, 200 Broadway  
Chicago, 40 Federal Street  
Cleveland, 1501 Park Building  
St. Louis, Central National Bank Building  
Philadelphia, 547 Ellicott Square  
St. Paul, 2nd National Bank Building  
Portland, 429 Kirby Building

## CHICAGO

### BRANCH OFFICES AND AGENCIES

Detroit, 1210 Woodward Avenue  
Kansas City, Mo., 400 Linhurst Building  
Seattle, 820 First Avenue S.  
Portland, Ore., First and Stark Streets  
San Francisco, 168 Second Street  
Los Angeles, 161 N. Los Angeles Street  
Denver, Lindrooth, Shubert & Co., Boston  
Building

## INDIANAPOLIS

Louisville, Ky., Frederick, Wehle, Stark  
Building  
New Orleans, C. O. Hunt, 504 Canalelet  
Building  
Birmingham, Ala., S. I. Morrow, 720 Brown  
Marx Building

In Canada, Canadian Link-Belt Co., Ltd., Toronto and Montreal  
H. W. Caldwell & Son Co., Chicago, New York, Dallas, Texas

## PRODUCTS

**Elevators and Conveyors for all materials; Coal and Ashes Handling Machinery; Screens, Crushers, Feeders, Water-Intake Screens; Locomotive Cranes; Coal Storage Systems; Grab Buckets; Elevator Buckets; Chains, Gears, Sprocket Wheels; Transmission Machinery, Silent Chain Drives; Steel Roller Chains; Belt Conveyors, Bucket Carriers, Screw Conveyors, Electric Hoists; Portable Loaders, Car Unloaders.**

## ELEVATING AND CONVEYING MACHINERY

The usefulness of Link-Belt Elevating and Conveying Machinery and its adaptability to a wide range of industries is evident to anyone who observes what is going on in all lines where materials are handled from one place to another. Its use benefits both employer and employee alike, under modern economic conditions.

The intensive production which characterizes the automobile industry, for instance, has been made possible by well-planned conveyors and elevators. Willys-Overland, Ford and other cars are assembled on continuously-moving conveyors, piece by piece being added by the assemblers at stations along the course of the conveyor. Frame after frame moves through the assembling room at a rate which allows proper time to make the various additions. Everything is planned to secure the highest efficiency mechanically, with the greatest convenience and least strain for the men. This same plan is being applied to other industries today, with the same success.

One important reason for the efficiency and popularity of modern conveying machinery for moving material in bulk (coal, stone, gravel, etc.) is the fact that the process is continuous; a steady stream of small quantities handled by the rapid succession of conveying flights or buckets, transports a large amount

of material in a day, although the machinery used requires but small space and little power for operation. Loading and discharging are automatic, reducing operating expenses to a minimum.

A list of the lines of industry in which Link-Belt machinery is employed comprises practically the entire line of industrial activity, because wherever labor is used, there is a type of Link-Belt product which makes that labor more effective--and more contented.

Link-Belt equipment is always built to fit the conditions. Practically every handling problem is different, requiring individual attention and study.

By that, however, we do not mean that there are no standard Link-Belt machines. We have many, such as our locomotive cranes, electric hoists, portable loaders, etc., etc., which are recognized standard types of machines the country over. Such machines often form part of a larger general plan.

The question to determine is: what plan will accomplish the results you wish to obtain with the greatest effectiveness and economy.

It is not practicable for us to give information in this publication which would enable you to pick out such machinery as you might feel would solve your problem. It is to your advantage, as well as to ours, to let our experienced engineers study your problems and recommend conveying equipment which will accomplish your results in the most economical way. We make no charge for advice, layouts or estimates.

Our experienced engineers are prepared to give prompt service in the solution of elevating and conveying and power transmission problems based on our years of experience in this work.

Write for General Catalog No. 300 which illustrates and describes the entire Link-Belt line, and tell us about your problems.



# ARTHUR D. LITTLE, INC.

Chemists—Engineers—Managers

Charles River Road

At Kendall Square

CAMBRIDGE, MASS.



## SERVICES

Thirty-five years of experience in the application of chemistry to industry means an accumulated knowledge of unusual value to clients. That is our record. A staff of over eighty persons with a capacity for service which is unexcelled is at your command. **Service** is our watchword. Some opportunities for helpfulness and profit to you may be suggested by the following brief outline.

**Industrial Research**—Development of new and better methods, new products and new opportunities for profit. In short, the betterment of industry by the application of chemical methods.

**Engineering**—Design, construction, and operation of plants where chemical principles are involved, such as Pulp and Paper, Naval Stores, Wood Distillation, Cement, Ceramics, Phosphates, Sugar, Starch, etc.

**Process Control**—Improvement and standardization of output by scientific control.

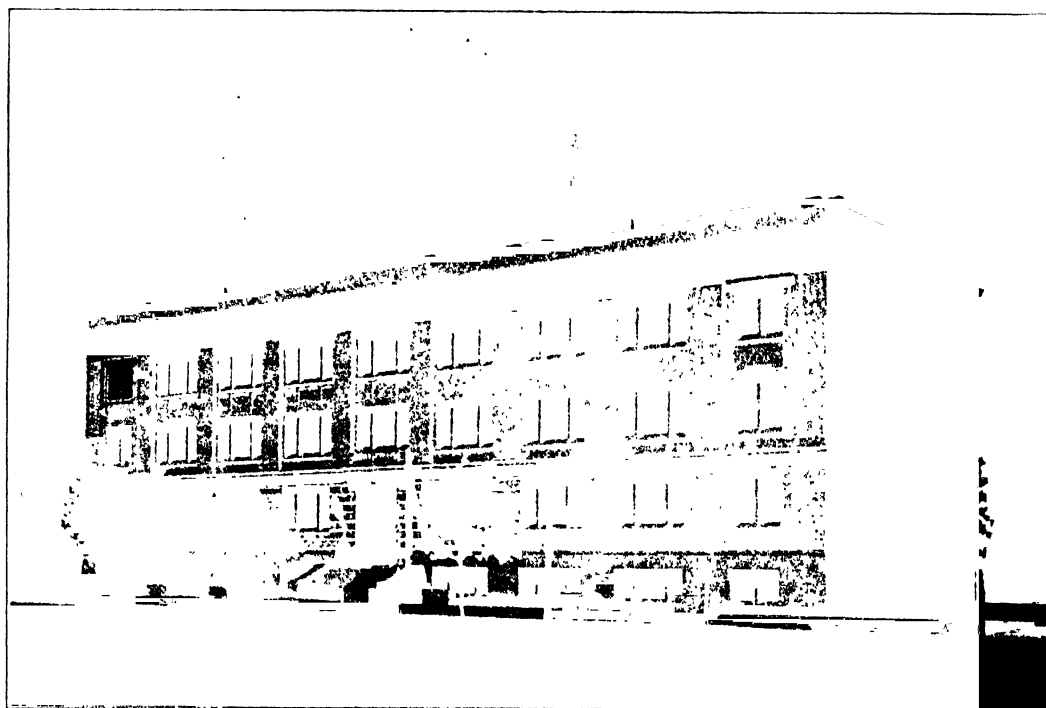
**Technical Reports**—Prepared for Bankers, Investors, Manufacturers, etc., to assist in determining the status of existing industries and the soundness of industrial proposals; advice on new processes, new products, efficiency of equipment and of operating plant, waste utilization, etc.

**Industrial Surveys**—Studies of the natural resources of defined territories and development of industries of sound economic justification.

**Control of Materials**—Analyses and physical tests of all kinds.

**Management of Production**—A climax of real chemical service which is often the keystone of success. The actual management of processes in the plant until effective and profitable results are assured.

**Contract Service**—A service which amounts to the addition of a score of highly trained technologists to the organization of the manufacturer, available for continual advice and consultation.



INDUSTRIAL RESEARCH LABORATORIES OF ARTHUR D. LITTLE, INC.

# LONG ISLAND FOUNDRY CO., INC.

Manufacturers of  
**Grey Iron Castings**  
 11TH STREET NEAR VERNON AVE., LONG ISLAND CITY, N. Y.

## PRODUCTS

Chemical Castings for all purposes. Also special castings made to specifications such as,  
 Furnace Castings  
 Retorts  
 Caustic Pots  
 Machinery Castings of every description

## FACILITIES

Equipped with traveling cranes, most modern foundry machinery and housed in an all-daylight modern foundry building, this plant is equipped to turn out castings of the highest service at a reasonable cost. Our facilities are excellent for shipping to any part of the country as all the trunk railroad terminals are within easy reach.

## GREY IRON CASTINGS

We are prepared to turn out a high grade of Grey Iron Castings for any form of chemical or industrial equipment.

We will be pleased to estimate on drawings submitted to us by chemical engineers and other designers of machinery.

Our manufacturing facilities enable us to undertake the production of castings of any weight up to and including 5 tons. Thus we can turn out satisfactory large castings for evaporators, condensers, stills, retorts, all kinds of flanges, valves, manifolds, parts of mills, crushers, filter-presses, etc.

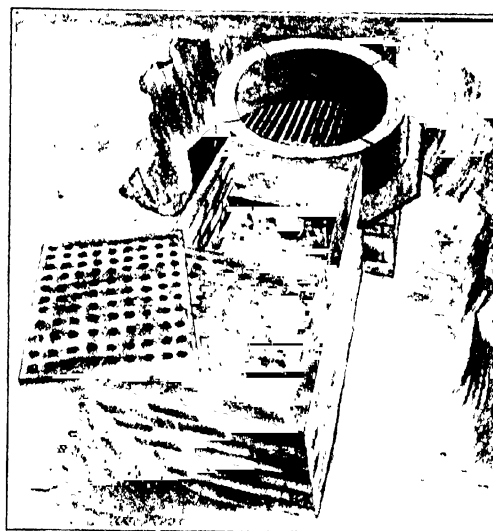
The quality of our castings is of the very best. Our iron is selected by test, and all stages of our manufacture are in the hands of expert foundrymen.

In addition to constantly endeavoring to preserve the high quality of our castings, we make a special point of giving satisfactory service to our customers. You may submit us your designs for estimates in the confidence that our terms and deliveries will be right.

## OUR SPECIAL CAST-IRON FIRE-BRICK FURNACE

We have designed and built this special furnace for heating any kind of kettle, or other chemical equipment. It does not require any fire brick or refractory lining of any kind, thus eliminating expensive brick settings and renewals, besides being an economy in first cost and upkeep of the heating unit.

This furnace is designed for use in varnish and chemical works.



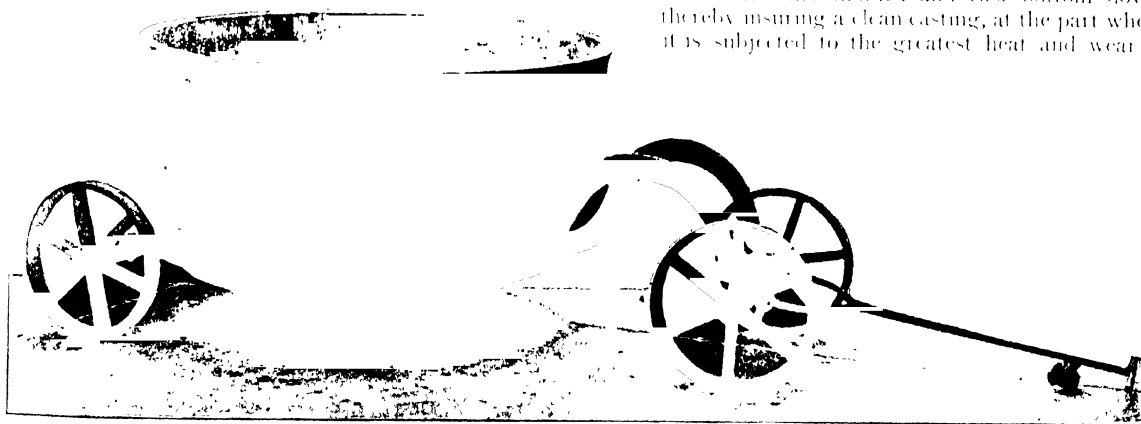
SPECIAL CAST IRON FIRE BRICK FURNACE

## OUR CAST IRON VARNISH KETTLES

These kettles are built in a number of sizes for boiling varnish. They are rugged and sturdy castings.

They are not a sweep casting but are specially built from a pattern. The thickness at the bottom is increased to withstand high heat, expansion and other strains.

These kettles are molded and cast bottom down, thereby insuring a clean casting, at the part where it is subjected to the greatest heat and wear.



CAST IRON VARNISH KETTLE WITH TRUCK

# LOUISVILLE DRYING MACHINERY COMPANY

## MANUFACTURERS OF EVAPORATORS, DRYERS AND PRESSES

### LOUISVILLE, KY.

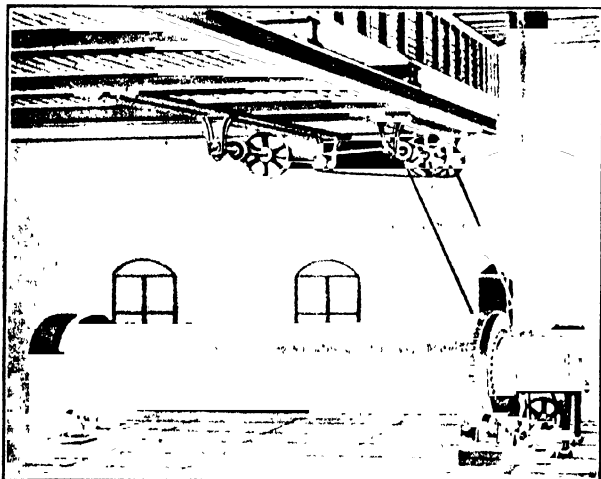
**PRODUCTS:** Rotary Dryers, both Steam and Fire; Tankage Dryers, Meal Dryers; Continuous Filtering Machines for pressing Starch Feeds, Brewers' and Distillers' Spent Grains.

Sugar Granulators and Coolers; single and multiple Effect Evaporators; Vacuum Pans; Salt Extractors.

#### LOUISVILLE DRYERS:

The various types and styles of our Dryers are applicable to any material that can be dried in a Rotary Dryer.

The Fire Dryers for materials that are not injured by the gases from the furnace and can stand great heat are of the counter current type.



**DIRECT STEAM DRYER**

**Fire Dryers:** Where the materials are not injured by too much heat the heat and materials travel in the same direction. Where the furnace gases are injurious to the materials, we manufacture Indirect Heat Fire Dryers. These Dryers are manufactured in all sizes from 38" to and including 6' and any length desired. The Fire Dryers are used on any non-combustible materials that must be dried.

The Steam Dryers are for live steam and are built to stand a pressure of 100 lbs. Tubes extend through the entire length and the dryer is relieved of the condensation scientifically and continuously which gives it a capacity much greater than the other types. The dryer is made in all sizes from 38" to 72" in diameter and with tubes from 18' to 24' long. The dryer is used on all combustible materials, principally for roots and food and especially Hay, Apple Pomace, Starch, Brewers', Distillers' and kindred feeds, damp prams, tankage and materials that would be discolored by too much heat and which can be dried on a rotary dryer.

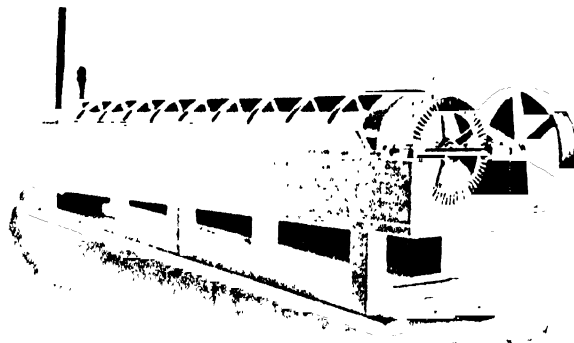
The Sugar Granulators are Indirect Rotary Dryers. The heat is supplied by a steam battery and they are made in sizes from 1500 lbs. to 150,000 lbs. of sugar per day. The dryer is used for all materials that cannot stand a heat above 200° and which can be dried in a rotary dryer. The dryers are lined with wood and all iron which comes in contact with the material is covered with copper for materials that are affected by coming in contact with iron.

#### SINGLE AND MULTIPLE EFFECT EVAPORATORS:

We build these of the standard vertical type. They have a large circulating tube in the center. The different sizes range from twenty-four to seventy-two inches in diameter and of any height desired.

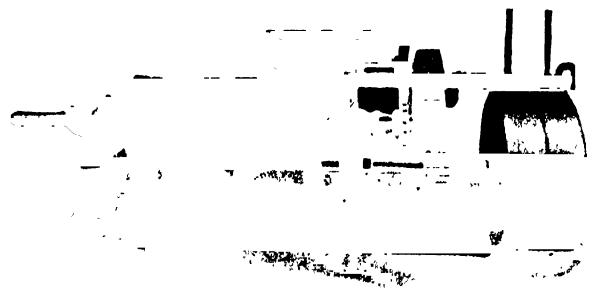
#### VACUUM PANS:

These are of the coil type and range up to and including seventy-two inches in diameter.



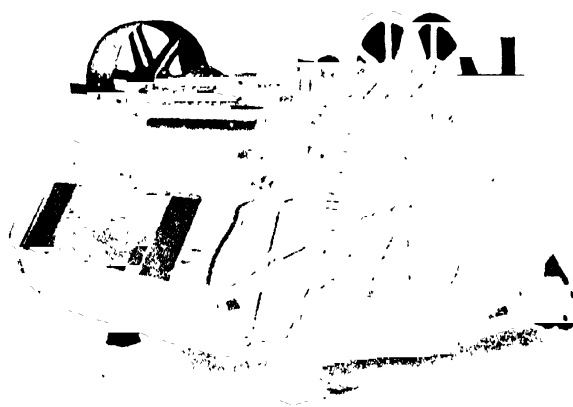
#### MEAL DRYERS:

The Meal Dryers are of the Rotary type with steam pipes running the full length. This dryer is intended for meals, small grains and similar materials that would scorch if permitted to lie on hot pipes.



#### THE EXPELLER:

This machine is for extracting the excessive moisture in many different materials and is intended to supply the demand where a cheaper filtering machine is wanted than the Continuous Filtering Machine. It is also continuous in its operation.



#### CONTINUOUS FILTERING MACHINES:

Continuous Filtering Machines are intended to extract the moisture from glucose, starch feeds, brewers' spent grains, distillers' slops and kindred materials, which contain too much moisture to go direct into the dryer.

The principle is a perforated sectional metal belt passing between rolls. The material from which the excessive moisture is to be extracted is fed in here on the perforated belt and carried between the rolls. The machine is continuous in its operation.

# LOVE BROTHERS INCORPORATED

Founders and Machinists

AURORA, ILL.

## PRODUCTS

Build to Blueprints and Specifications Any Appliances or Machines, in Iron, Steel or Bronze.

**Acid Pots and Pans**

**Acid Resisting Castings**

**Bone Black Kilns**

**Brass and Bronze Castings**

**Castings for:**

Acid Manufacture

Lead Works

Plate Glass Manufacture

Zinc Works, Etc

**Castings for Starch and Sugar Mills**

**Chemical Castings**

**Filter Presses and Filter Press Parts**

**Gray Iron Castings**

**Hard Iron Castings**

**Heat Resisting Castings**

**Lead Pots and Pans**

**Machine Shop Work**

**Niter Boxes**

**Pattern Work**

**Retorts**

**Rubber Machinery**

**Screw Conveyors**

**Special Alloyed Iron for:**

Ash Conveyor Parts

Grinding Parts

Liners for Grinding Mills, Etc.

Welded Steel Products

States, as it has prompt connections with all trunk line railroads in all directions.

## MANUFACTURING FACILITIES

The manufacturing facilities of this company include

A large, well equipped pattern shop

Modern machine shops with ample tool and crane capacity.

Foundries with capacity to take care of castings up to ten tons in weight.

The Foundries are experienced in making gray iron castings of all grades and analysis, also in all types of chilled iron, white iron, and hard alloyed iron castings.

## WELDING DEPARTMENT

Equipment, stock of material, and experienced operatives are available for the manufacture of complete installations of welded steel products, especially in connection with the building of watercooled parts for all classes of steel furnaces, heating furnaces, annealing furnaces, etc.

Inquiry is invited along the lines of the products listed herein, and as to foundry and machine shop work in general, not only for complete machines, but for special orders.

Prompt attention and satisfactory deliveries are given to orders of a jobbing character.

The superior character of Love Brothers' castings is known throughout the United States, and the machine work is likewise generally commended by hundreds of satisfied customers, whose repeated orders have proved even more strongly than any verbal testimony that they know where they receive satisfactory attention and really good work.

## LOCATION AND FACILITIES

The location of the works of this company at Aurora, Ill., is especially good for receiving raw materials and for shipping to all parts of the United

# THE LUDLOW-SAYLOR WIRE CO.

Manufacturers of

**"Perfect"** Double Crimped Wire Cloth and  
Rek - Tang Rolled Slot Screens  
ST. LOUIS, MO.

Chicago

BRANCH OFFICES  
Salt Lake City

El Paso

## PRODUCTS

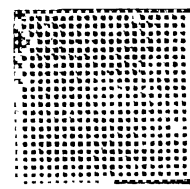
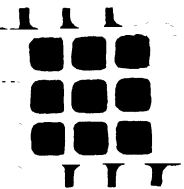
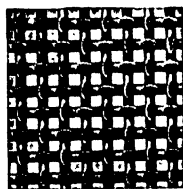
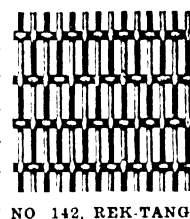
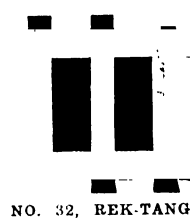
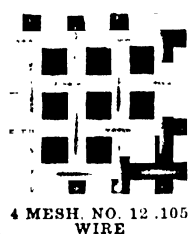
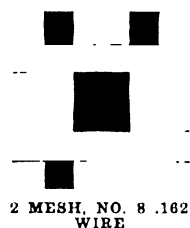
Double Crimped Wire Cloth and Rek-Tang Rolled Slot Screens in all commercial metals for all purposes.

We specialize in wire screens for the Mining Industry.

### DOUBLE CRIMPED WIRE CLOTH

Years of experiment and experience have given to Ludlow-Saylor products an unqualified superiority over all other grades of wire cloth.

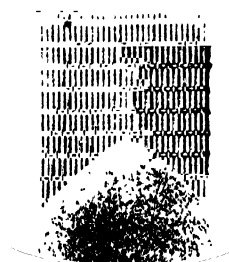
In the weaving of the "Perfect" Double Crimped Wire Cloth, each wire supports and strengthens every other wire, the shoot wires being arched over and under the warp wires, and the warp wires arched over and under the shoot wires, thus forming a mesh that is absolutely and permanently rigid, eliminating all possibility of wires slipping and insuring an evenness of the screened product. And the wires are not bent but **Crimped**, not with sharp angles, but curved gradually and gracefully over and under the intersecting wires, without any rough corners. Thus the full strength of each wire is retained and its surface kept smooth and unbroken. All strain is equally distributed over the entire screen, and the openings remain uniform and equal as long as there remains enough metal to sustain the weight of the material to be screened.

8 MESH, NO. 16 .063  
WIRE ROLLED4 MESH, NO. 18 .047  
WIRE22 MESH, NO. 24  
.023 WIRE

## REK-TANG ROLLED SLOT SCREENS

A Significant Comparison—The Lesson of Experience.

The three illustrations shown below tell a very strong story of the marked superiority in "Producing Power" of Rek-Tang Rolled Slot Screens.



REK-TANG



SQUARE MESH



PERFORATED METAL

They show the relative discharging capacity (producing capacity) in a given time of equal areas of (1) **Rek-Tang**, (2) Square Mesh, and (3) Perforated Metal.

They show that the production goes rapidly downhill in the order named, with **Rek-Tang** having a 50% to 100% greater productivity than Perforated Metal.

This comparison is based on actual commercial tests, and proves conclusively the superiority of **Rek-Tang** Screens.

## ORDER CAREFULLY

Be sure and give full information when ordering wire cloth. Don't forget to give: Number of rolls, or number of pieces; length and width of each piece or roll; mesh; decimal size of wire and material from which cloth is to be made.

## DELIVERY

Our central location and tremendous capacity assure the promptest delivery of your orders.

**WRITE FOR OUR CATALOG**





# THE LUZERNE RUBBER COMPANY

Manufacturers of Hard Rubber Products

TRENTON, NEW JERSEY

CHICAGO OFFICE: 564-570 W. Monroe St.

## PRODUCTS

Hard Rubber Pipe, Fittings, Buckets, Funnels, Agitating Spiders, Tank Car Strainers, Nitroglycerine Skimmers, etc.

Hard Rubber Sheet Rod and Tubing.

All Hard Rubber Moulded products for Chemical or Electrical use.

Hard Rubber Automobile Accessories—i.e.:

Storage Battery Jars, Radiator Caps, Lever Balls, etc.

Fountain Pen Material and Hard Rubber for all particular Hand Turning; Drug Sundries.

Hard Rubber for Water Meters.

## HARD RUBBER FOR HANDLING CHEMICALS

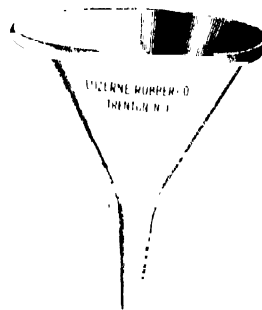
The Luzerne Rubber Co. manufactures pipe and fittings and special articles of tough and durable stock especially designed to withstand the action of chemicals. Pipe and fittings are supplied in all sizes from  $\frac{1}{4}$  inch up. This material is recommended for use with Acetic, Citric, Hydrochloric, Nitric and Sulphuric Acids, Caustic Soda and Potash, and most acid or alkaline solutions which corrode metals or other materials. All fittings are furnished with Standard Iron Pipe Thread. Pipe, plain or threaded.

Send us your blue prints of assembly and we will gladly quote on furnishing material ready for installation. Buckets are supplied in 1,  $1\frac{1}{2}$ , 2, 3, 4, and 5 Gal. Capacity, with or without spouts. Pipe flanges threaded or vulcanized on pipe.

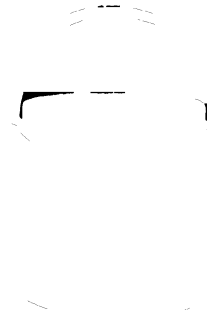
Hard Rubber while extensively used in the Chemical Industries is by no means limited to this line.

It enters into the manufacture of hundreds of articles in as many different lines of work, each demanding a material especially adapted to its requirements. This condition places on the market many different grades of Hard Rubber. Among the products of the Luzerne Rubber Company is a grade of Hard Rubber suited for your purpose and samples will be submitted upon receipt of advice, stating the purpose for which the material is to be used.

Estimates submitted on any Hard Rubber articles. In requesting estimates on specialties, be sure to specify accuracy and finish required, giving all information possible.



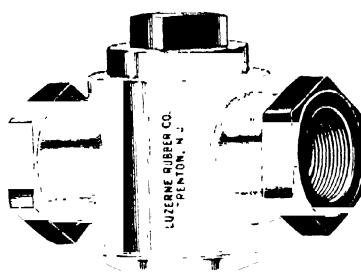
FUNNEL



BUCKET



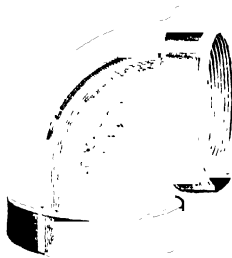
UNION



PLUG COCK



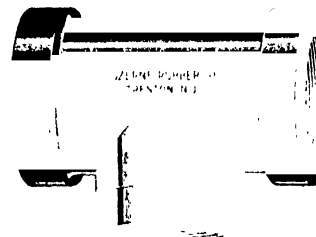
COUPLING



ELBOW



STRAIGHTWAY COCK



TEE

# THE WALTER E. LUMMUS COMPANY

Manufacturers of

Distilling, Condensing, Evaporating and Extracting Machinery  
Builders of Chemical Works and Refineries

173 MILK STREET, BOSTON, MASS.

WORKS - EVERETT, MASS.

## PRODUCTS

### Complete Plant Installations:

Industrial Alcohol and Ether.  
Beverage Dealcoholization.  
Wood Distillation; Methanol, Turpentine.  
Acetone and Acetic Acid.  
Formaldehyde.  
Tannins, Resin and Oil Seeds Extraction.  
Solvent Recovery.

Gas By-Products; Benzol, Toluol.

### Standard Equipment:

Continuous and Periodic Stills and Rectifiers.  
Vacuum Stills and Evaporators.  
Extractors and Dissolvers.  
Gas-Vapor Absorbers and Scrubbers.  
Condensers and Heat Interchangers.  
Standard Accessory Equipment.

## ORGANIZATION AND FACILITIES

The Walter E. Lummus Company is a Massachusetts Corporation. It owns and operates a factory at Everett, Mass., with ample facilities for the construction, assembling, and testing of all the principal types of apparatus manufactured by the company. In addition to its own plant the company has favorable connections with reliable foundries, machine shops, and sheet metal working establishments in the U. S. and Canada providing elastic capacity for extra business. This arrangement enables the company to handle extensive undertakings in plant construction with minimum cost and delay.

The experience acquired by twenty-eight years of continuous activity in the design and construction of chemical plant is available to our customers together with a vast accumulation of information pertaining to the various chemical and related industries which it is intended to serve.



ASSEMBLY AND TESTING FLOOR—P103

## INDUSTRIAL ALCOHOL AND ETHER

**Alcohol Distilleries**—The increased demand for alcohol for industrial and power purposes offers the prospect of profitable manufacture from materials hitherto considered unavailable; and also distilleries have become practical in localities which, though possessing cheap materials, were formerly considered too remote from market. The materials that have become available by reason of the increased price and wider use of alcohol are diverse, including: molasses, cane juice, fruit juices, sago palm, sorghum, raisins and other dried fruits, waste liquors of sulphite paper pulp manufacture and the alcohol produced as a by-product in the manufacture of non-alcoholic beers and wines.

We are prepared to furnish complete fermenting and distilling equipment for large central distilleries equipped with modern economical apparatus, and likewise to provide the simpler and less expensive apparatus adapted to the requirements of plantations and rural distilleries.

**Fermentation plant for grains and starchy materials**—We provide elevating and milling machinery, cooking and malting equipment, pure yeast apparatus, fermenting tubs, tanks, and all necessary vessels, pumps, mash coolers, and tempering coils according to the governing conditions.

**For molasses, sugar and fruit juice distilleries**—Fermenting equipment includes pure yeast apparatus, acid tank, fermenting tubs with or without tempering coils, pumps, and all necessary accessories favorable to high conversion of sugar content.

### Lummus Continuous American Type "Beer" Stills

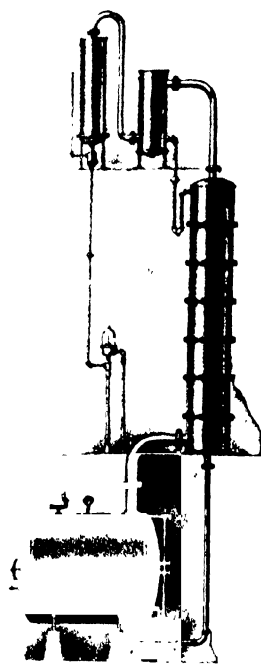
—Especially adapted to the economical separation of alcohol from fermented mashes and "beers" of low alcoholic strength, and their concentration to 120° to 160° proof=60 to 90%; =23° Cartier to 31° Cartier. This is the most economical and cheapest apparatus for the distillation of mashes from which the alcohol is to be subsequently rectified by a separate operation.

**Lummus Periodic (Batch) Rectifying Stills**—Especially suitable for rectifying spirits of variable composition, by non-continuous operation, and hence for small distilleries and those subject to seasonal operation.



CONTINUOUS "BEER" STILL—C310

*Continued on Next Page*



STANDARD RECTIFYING  
STILL—C231

For high proof industrial Alcohol—190° to 194° 95% to 97%, producing large yields of high grade spirit from proof (50%) in one operation.

**Lummus Combination Continuous Distilling and Rectifying Stills**—Separate and rectify alcohol for industrial purposes in one operation direct from mashes or fermented wash, and have successfully handled liquors containing as low as  $\frac{1}{2}$  of 1% alcohol. This apparatus can be provided to manufacture highest quality commercial spirits with simultaneous separation of fusel oils and ethers.

The double column continuous still shown in line illustration E239 is especially designed for the most economical manufacture of fuel alcohol.

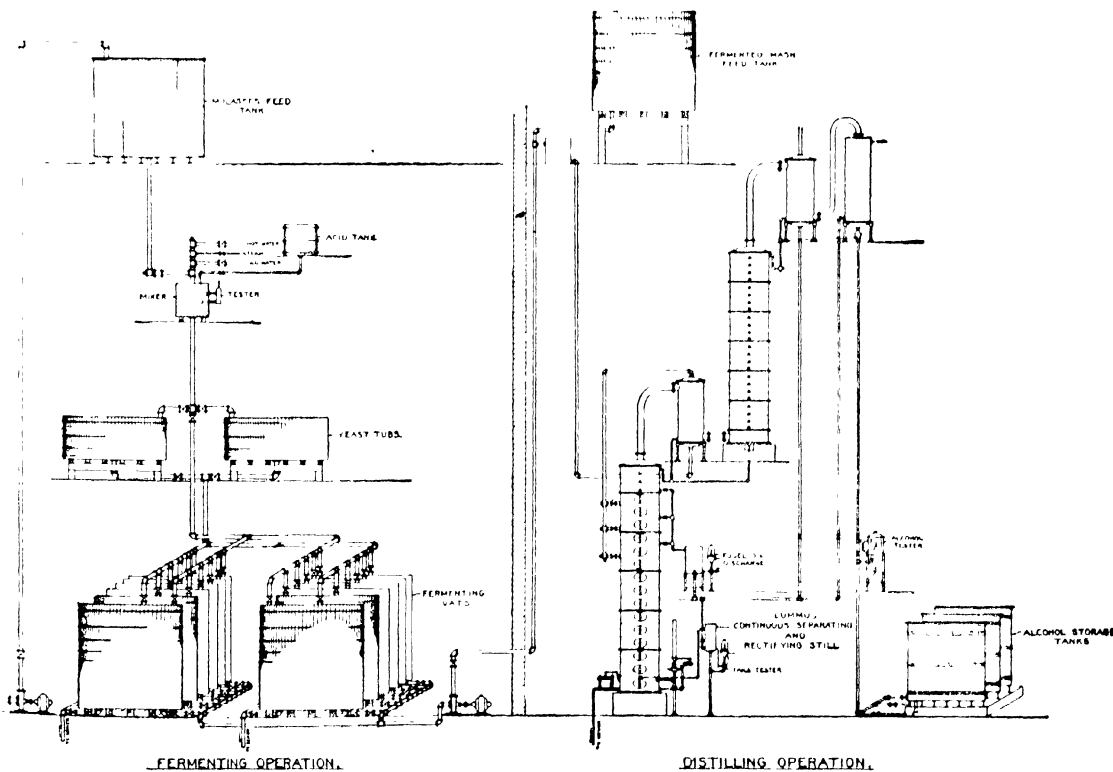
**Lummus Special Continuous Stills**—For Sulphite and other waste liquors are designed to produce merchantable spirit from lowest grade materials, and are built with special reference to the suppression of offensive odors, and resistance to corrosion. They are provided with means

for maximum utilization of waste heat, and the elimination of unessential elements common to conventional types of plants, so that great economy is obtained.

**Ether Installation**—The increasing demand for alcohol for use in internal combustion engines has stimulated interest in ether as the most practical accessory ingredient for increasing vapor pressure and consequent ease of ignition. Ether has the great advantage of being produced directly from alcohol by a simple and easily controlled process. We offer improved ether generating apparatus which is designed for continuous operations and most economical use of sulphuric acid; also continuous concentrating stills for fuel as well as U. S. P. grades. Our new method of ether condensation is especially adapted to hot climates and insures complete liquefaction without the aid of expensive refrigeration.

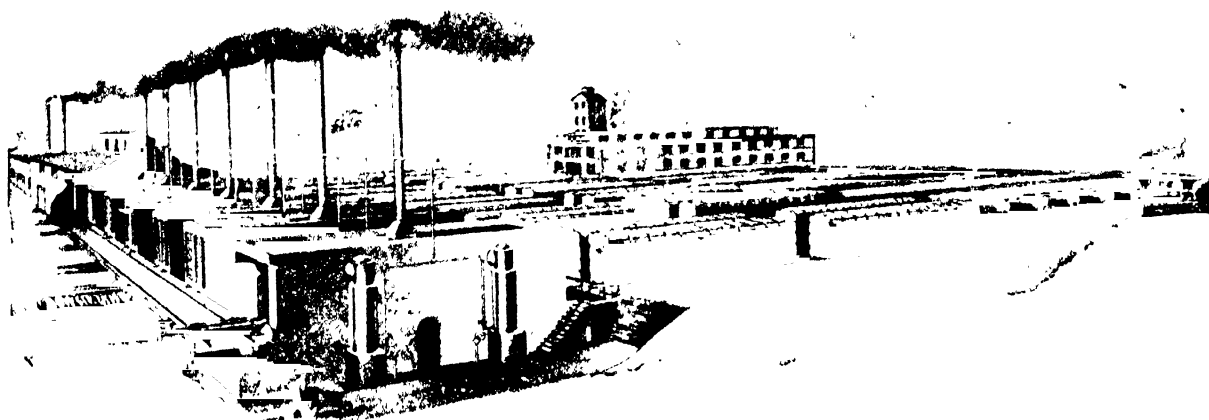
**Beverage Dealcoholization**—The manufacture of beer, subject to the limitation of a maximum alcohol content of  $\frac{1}{2}$  of 1%, which shall at the same time be palatable and nutritious, requires that the alcohol shall be removed with a minimum exposure of the beer to heat or prolonged distillation, and its protection from contact with materials likely to affect its taste or appearance. Lummus Continuous Stills can be supplied for either vacuum or atmospheric pressure with provision for concentrating the alcohol to 190 proof. They provide for the briefest possible heating of beer, and prompt cooling and removal to storage.

We offer the services of our dealcoholization expert, whose practical knowledge of the composition and characteristics of beer and long experience in its manufacture have led to the development of a process for



MOLASSES INDUSTRIAL ALCOHOL DISTILLERY—E239

*Continued on Next Page*



AMERICAN CHARCOAL BY-PRODUCT WORKS—D56

dealcoholization which assures a product that cannot be distinguished from the best beets of former days. The fine equipment required for this delicate process is of Lummus design and construction.

#### WOOD DISTILLATION

We supply complete equipment including retorts, stills, tanks and all accessories for the manufacture of charcoal and its by-products from either hard or resinous woods. We have standard types of retort and chemical house equipment adapted to any variety of wood susceptible of profitable distillation and offer our long experience in this industry for the solution of problems incidental to new installations and the improvement of economy in existing plant.

**Retort Equipment**—Two standard types of retort are available according to local conditions. These are: (a) The oven type, standard capacity 10 cords, or 20 tons each, to which the wood is introduced, distilled, and withdrawn while resting in steel cars, without handling. (b) The cylinder type, capacity  $\frac{5}{8}$  cord or about 1 metric ton, which is loaded, fired, and unloaded by hand. Except for the difference in size and the method of handling the operation of both types is similar, and the yield and quality of products practically identical, but they differ greatly in economy of operation and upkeep according to the conditions in the locality of installation. The chief advantage of the oven type is economy of labor, and expedition in handling large quantities of material. The advantage of the cylinder type lies in the lower cost for upkeep, simplicity of repair, and the saving obtainable in countries where labor is cheaper than machinery. The cylinder retorts are also easier to install in localities remote from transportation routes.

**Lummus Retort Condensers**—Our tubular retort condensers, accessible type, effect superior liquefaction and cooling of the valuable vapor by-products, and have the special advantage of easy access for cleaning both inside and outside of tubes. A special gas trap provides for the separate recovery of waste gas of important fuel value.

For installations subject to high costs of fuel, we provide stills and equipment embodying important refinements of heat economy by means of multiple effect evaporators, heat exchangers, and the like when the savings effected justify the capital investment. On the other hand, where fuel and wood are cheap, we provide simpler and less expensive equipment equally effective from the standpoint of production.

We offer complete standardized equipment correctly proportioned and built to stand up under continuous operation including:

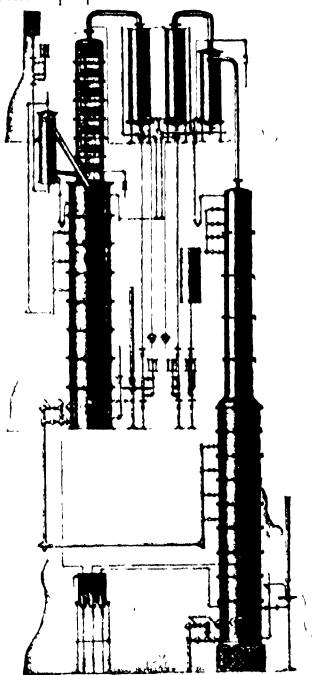
- Settling Tanks and Pumps
- Tar Stills and Condensers
- Raw Liquor Stills or Evaporators
- Neutralizing Tubs and Lime Slaker
- Continuous or Batch Acetate-Alcohol Stills
- Continuous or Batch Refining Stills
- Seeding Pans, Wash Tanks and Pumps

**Resinous Woods**—Special equipment for the extraction process and for steam or destructive distillation processes—

- Retorts and Condensers
- Separating Tanks
- Crude Stills, Tar Stills
- Turpentine and Pine Oil Refining Stills
- Storage and Shipping Tanks and Pumps

**Methanol Refining**—This process, formerly a complicated and secret operation, has been reduced to a simple and methodical procedure that may be conducted on a moderate scale in batch apparatus of reasonable cost and on the larger scale in continuous apparatus representing the maximum economy.

Lummus Continuous Refining Stills produce the highest grade of Methanol containing below  $\frac{1}{20}$  of 1% acetone.



CONTINUOUS REFINING STILL—E218

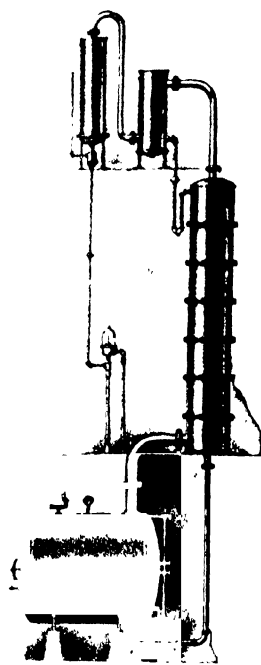
#### ACETONE AND KETONE OILS

Revolving or fixed retorts with special acetone retort condensers. Our special Acetone Refining Stills with Acetone Rectifying Columns produce commercial and war office grades, also light and heavy Ketone oils.

#### ACETIC ACID

**Vacuum Decomposing Stills**—Standard sizes of special cast iron vacuum generators provided with revolving rouser, dust chamber and condenser. Reagent tank connection.

*Continued on Next Page*



STANDARD RECTIFYING  
STILL—C231

For high proof industrial Alcohol—190° to 194° 95% to 97%, producing large yields of high grade spirit from proof (50%) in one operation.

**Lummus Combination Continuous Distilling and Rectifying Stills**—Separate and rectify alcohol for industrial purposes in one operation direct from mashes or fermented wash, and have successfully handled liquors containing as low as  $\frac{1}{2}$  of 1% alcohol. This apparatus can be provided to manufacture highest quality commercial spirits with simultaneous separation of fusel oils and ethers.

The double column continuous still shown in line illustration E239 is especially designed for the most economical manufacture of fuel alcohol.

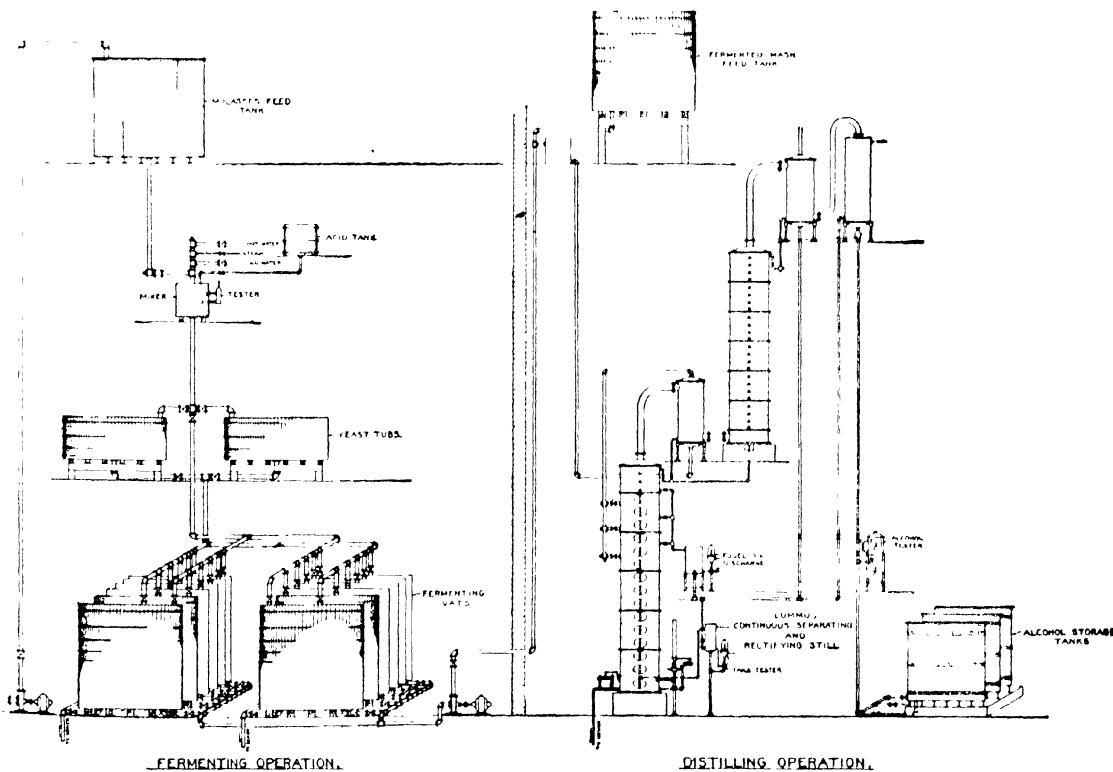
**Lummus Special Continuous Stills**—For Sulphite and other waste liquors are designed to produce merchantable spirit from lowest grade materials, and are built with special reference to the suppression of offensive odors, and resistance to corrosion. They are provided with means

for maximum utilization of waste heat, and the elimination of unessential elements common to conventional types of plants, so that great economy is obtained.

**Ether Installation**—The increasing demand for alcohol for use in internal combustion engines has stimulated interest in ether as the most practical accessory ingredient for increasing vapor pressure and consequent ease of ignition. Ether has the great advantage of being produced directly from alcohol by a simple and easily controlled process. We offer improved ether generating apparatus which is designed for continuous operations and most economical use of sulphuric acid; also continuous concentrating stills for fuel as well as U. S. P. grades. Our new method of ether condensation is especially adapted to hot climates and insures complete liquefaction without the aid of expensive refrigeration.

**Beverage Dealcoholization**—The manufacture of beer, subject to the limitation of a maximum alcohol content of  $\frac{1}{2}$  of 1%, which shall at the same time be palatable and nutritious, requires that the alcohol shall be removed with a minimum exposure of the beer to heat or prolonged distillation, and its protection from contact with materials likely to affect its taste or appearance. Lummus Continuous Stills can be supplied for either vacuum or atmospheric pressure with provision for concentrating the alcohol to 190 proof. They provide for the briefest possible heating of beer, and prompt cooling and removal to storage.

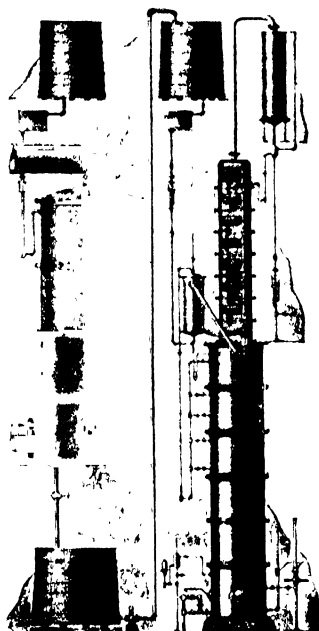
We offer the services of our dealcoholization expert, whose practical knowledge of the composition and characteristics of beer and long experience in its manufacture have led to the development of a process for



MOLASSES INDUSTRIAL ALCOHOL DISTILLERY—E239

*Continued on Next Page*

by ordinary means in proportion to their diffusion in uncondensable gases. Since the cost of recovery plant is proportional to the volumes of gas or vapor to be handled rather than the value or quantity of solvents to be recovered, it is wise to reduce the quantity of air when practicable. The Lummus system of reliequifying evaporated solvents from gas-vapor mixtures is embodied in relatively simple apparatus requiring little or no power, seldom any refrigeration, and only so much heat as may be required for the separation of the recovered mixtures. Inquiries should state composition of the mixture and describe kind and quantity of solvent to be recovered and the maximum quantity of air or gas to be handled.



CONTINUOUS ABSORPTION  
SYSTEM—D592

(b) **Recovery of Volatile Solvents from Liquors and Solids**—Volatile solvents that have been used in compounding and in the application of dyes, mordants and reagents, washes and cleansing mixtures, degreasing and degumming operations, however contaminated, are usually susceptible of complete recovery by means of our improved concentrating stills which we furnish in batch or continuous type with simple equipment of tanks and pumps if required. Gasoline, alcohol, acetone, wood alcohol, ethers, turpentine and oils can usually be cheaply recovered and restored to original purity even when associated with dissolved solids or complicated solutions.

(c) **Separation of Mixture of Volatile Liquids**—The separation and complete purification of volatiles from complicated mixtures has become an indispensable economy in many industries. We can provide continuous fractionating stills capable of effecting practically complete separation of acetone from alcohols, benzene from oils, and other mixtures formerly considered difficult or impossible to repurify. For small quantities we offer batch stills, equally effective for separating and less expensive to install.

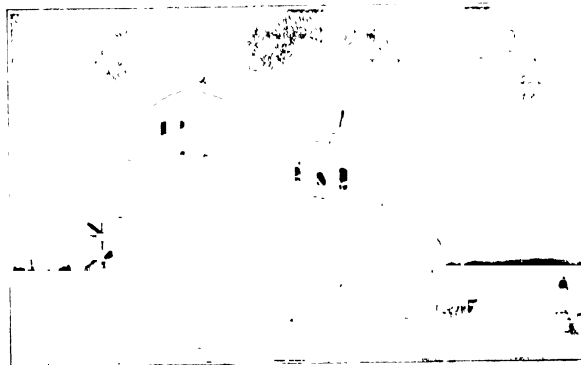
**Gas By-Products, Benzol, Toluol**—Benzol, Toluol and Xylols are of permanent importance to the dye and chemical industries; first, because of their reactive values, and second, on account of their valuable solvent properties. The unavoidable surplus has a legitimate outlet as fuel, the general recognition of which will extend as the gasoline supply diminishes.

We furnish Absorbers of the efficient cap and seal type for cases where incidental back pressure is unobjectionable. Attention is called to our new type of Low Pressure Absorber which provides maximum capillarity for complete distribution of absorbing oil, using a new contact material which provides 50 sq. ft.

of surface per cubic foot of tower space occupied without obstructing the free flow of gas.

Lummus Horizontal Stripping Evaporators adapted both to wash oil and tar, for removal of oil. These stripping evaporators are readily accessible for cleaning and repairs and are more efficient than column strippers with external superheaters provide efficient heat interchangers for oils and tars which insure most economical operation.

Lummus Continuous Light Oil Separating and Refining Stills are recommended in place of batch stills as usually employed. The use of Continuous Stills in this connection represents our advance of the art. Not only is steam consumption greatly reduced, but the continuity of production thus afforded is an improvement that cannot longer be disregarded. For small installations and special conditions we offer Periodic Stills of improved design and efficiency. We provide all necessary washing equipment for chemical treatment when required.



LUMMUS REFINERY CONSTRUCTION—P119

### DISTILLING AND RECTIFYING APPARATUS, CONTINUOUS AND PERIODIC

To simplify description we roughly divide all standard types of stills into three classes: Plain Stills, Column Stills, and Continuous Stills.

**Standard Plain Stills**—Used for rough concentration of volatile liquids from solutions containing dissolved solids or less volatile materials. The essential elements of all Standard Plain Stills are a boiler or closed heating vessel in which vapor is generated, and a condenser for reliequifying the vapors. Contrary to common tradition, the shape of the still but slightly affects the quality of product, but is determined by mechanical considerations. Standard Plain Stills are of vertical or horizontal cylinder and pot-still types, heated by steam coils, tube bundles, steam jackets, or direct fire, and can be provided with stirring blades, cleanout doors, and special openings and attachments according to requirements. Capacities from 20 gallons to 20,000 gallons.

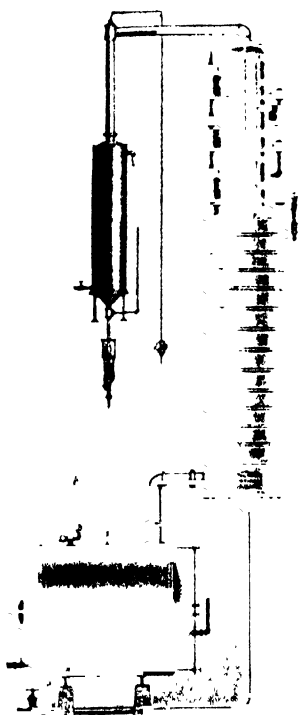
**Standard Column Stills**—Are designed for high concentration of volatile liquids, and, while more expensive than plain stills, are much more economical since they perform in one operation work that would require repeated distillations in the Plain Stills. They are comprised of a boiler, a distilling or rectifying column, an intermediate or regulating condenser, and a final or cooling condenser. Standard types include horizontal and upright boilers, distilling columns built on unit system to permit of varying the number of chambers in accordance with requirements, tubular or coil

*Continued on Next Page*

ing condensers, and cooling condensers, together with vapor pipe, fittings and accessories. It is important that the still should always have capacity to hold the entire batch of material and a surplus to

provide for redistilling intermediate and end fractions. While the size of the still fixes the quantity of a batch, the size of the column and condensers determines the rate of operation and quality of products and should, therefore, be selected with careful reference to the time for completing the distillation. Standard Column Stills can be provided of similar materials and capacities to the Plain Stills.

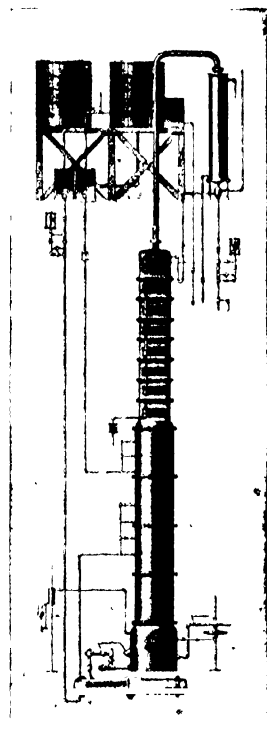
When inquiring for stills for any specific purpose, it is important to describe as precisely as possible the material to be distilled, products desired, and the maximum quantities to be handled in the working hours to which the operation is limited, or the rate per hour if for continuous operation. Information should also in-



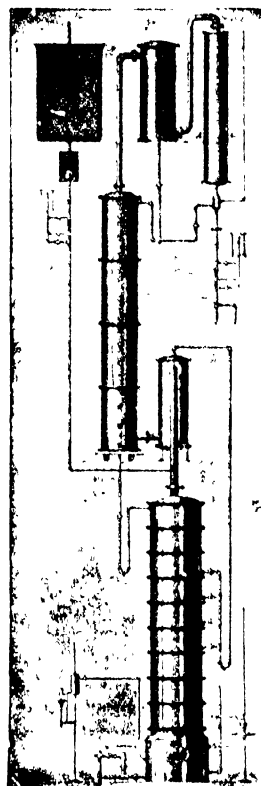
SPECIAL REFINING STILL—D471

clude quantity and pressure of steam available, temperature and quality of water, and any limit to be observed in respect to cost of installation, cost of fuel and materials, and any regulations pertaining to the trade or locality. With this information we can often assist materially in the selection of most profitable equipment for the purpose to be served.

**Standard Continuous Stills**—Are available for almost any kind of distillation that can be accomplished with Plain or Column Stills, and closely approach the maximum of theoretical economy in operation. Being built for automatic control, and extreme economy of steam and other operating costs, they are necessarily more expensive in small sizes but actually much cheaper where large quantities of material are handled. Continuous Stills consist of one



CONTINUOUS FRACTIONATING STILL—D586  
Patented System of External Dephlegmation

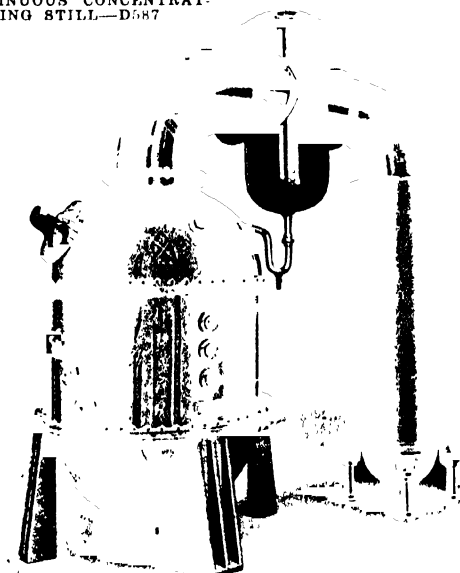


CONTINUOUS CONCENTRATING STILL—D587

or more distilling columns heated by steam and provided with condensers, coolers, feed heaters, and accessory devices for automatic regulation of heat, feed supply, and the discharge of distillates and residues. Standard sizes have capacity from 25 gallons to 3,000 gallons per hour of feed liquor, and can be furnished in copper, steel, cast iron and alloys with protective linings according to specific requirements.

### VACUUM STILL AND EVAPORATORS

**Jacket and Calandria Heated Vacuum Stills**—With or without revolving rouser, vacuum condenser and receiving chamber, substantially built of copper with polished cast bronze fittings, copper vacuum condenser, and equipped with wet or dry vacuum pump according to size and purpose served.

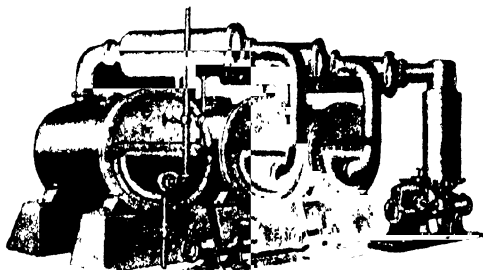


VACUUM PAN—G30

**Vacuum Condensers and Pumps**—Standard types of surface condensers and jet condensers, while well adapted to vacuum work when the vapor to be condensed is water, are entirely unsuitable to the condensation and recovery of alcohol, acetone and other volatile liquids of high value. Lummus Special Vacuum Surface Condensers are equipped to operate either with barometric, full pipe or with closed receiver tanks. Steam or power driven vacuum pumps can be supplied to requirements.

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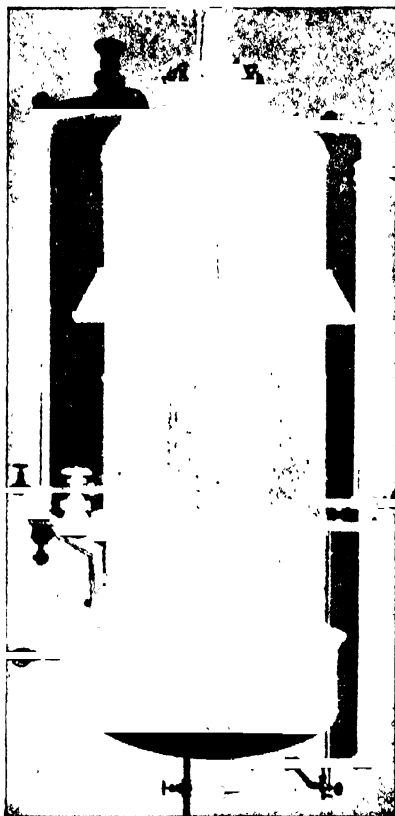
**Multiple Effect Evaporators**—For the economical concentration of dilute solutions we offer multiple effect apparatus of both horizontal and vertical tubular type. Our Submerged Tube Double and Triple Effect and Reversible Evaporators are particularly well adapted to liquids having a tendency to clog heating surfaces. Materials—steel, cast iron and copper, with protective coatings if required. Jet or surface condensers, pumps and receiver tanks.



HORIZONTAL TRIPLE EFFECT EVAPORATOR—G22

### EXTRACTORS AND DISSOLVERS

The processes known as extraction, percolation, leaching, and diffusion are simply dissolving operations varying only in the method of exposing soluble substances to the solvent with a view to most rapid or complete solution. For example, lumpy and non porous materials must be reduced to a suitable state of division in order to expose surface to the effective action of solvents. Similar considerations require very different



AUTOMATIC EXTRACTOR SOXHLET TYPE—P137

treatment of fibrous, cellular and powdered materials and for pulps and pomaces.

We can generally furnish stationary, dumping or revolving extractors adapted to batch or semi-continuous operation.

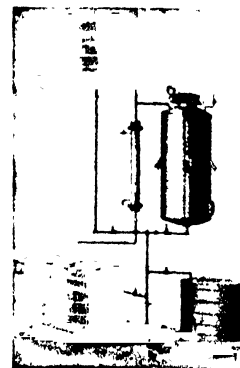
#### Lummus Batch Extractors

—Are designed for upward or downward displacement operations according as the materials have a tendency to float or sink in the menstruum employed; stationary and dumping types of steel, copper and cast iron, with protective linings, if required.

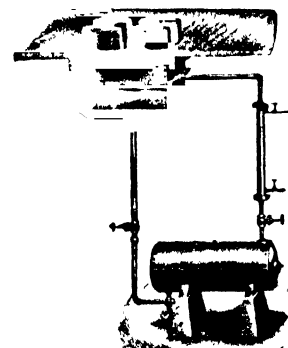
**Lummus Series Extraction Batteries**—Provide for stage concentration by means of which solutions of practically uniform strength are obtained requiring a minimum of cost to evaporate.

**Dissolvers**—Lummus Automatic Dissolvers are used in making stock solutions of caustic soda, calcium chloride, bichromate, alum, blue vitriol and other crystallized or fused chemicals, and are extensively used in Chemical Works, Textile Mills, Soap Factories, Bleaching and Mercerizing Plants and Rubber Reclaiming Works. They operate with cold water and require no steam either for heating or stirring, and have no moving parts to get out of order, or to consume power. They eliminate all danger to employees and require no attention other than the initial charging of the apparatus. They save time, labor and money, and save their cost in a few months.

One, two, four and ten drum sizes.



BATCH EXTRACTOR—B211



CAUSTIC DISSOLVER—D557

### GAS-VAPOR ABSORBERS AND SCRUBBERS

Standard types of towers include bubbling towers, hurdle towers, and spray type construction designed for intimate contact of liquids and gases at atmospheric, reduced or high pressure subject to regulated control of temperatures and flow, and can be equipped with precoolers, after-coolers or internal heating or cooling coils. Also see under Gas By-Products.

### CONDENSERS AND HEAT INTERCHANGERS

Our Standard Condensers and Coolers cover practically the entire range of industrial requirements including Lummus Tubular Retort Condensers for Charcoal Ovens and Retorts, Acetone Retorts and other high temperature operations. Lummus Standard Condensers and Coolers of all capacities and of any suitable material provide for temperature regulation, and for the complete liquefaction of volatile or corrosive products. We build Accessible Condensers and Coolers especially advantageous in localities where artesian and river waters contain encrusting material re-

*Continued on Next Page*



ing frequent removal. We have special coils and parallel condensers for precooling gases and recuperative condensers for the utilization of heat.

**Lummus Heat Interchangers** are available for the economical transfer of heat between liquids, between vapors and liquids, and between vapors and vapors. With full information of capacities and temperatures we can generally supply a standard unit of high efficiency at moderate cost, and of suitably durable material.



ACCESSIBLE CONDENSER—GC108



HEAT INTERCHANGER, REMOVABLE TUBE BUNDLES—P136

#### AIR LIFTS, METROLIFT

The Metrolift is an automatic air lift or montejus that will lift and convey any clear liquids, at the same time measuring, counting and recording the service. It will start and stop itself without attendance, and in short perform the service ordinarily required of a steam pump plus a watchful (?) attendant. It is not contended that pumping with compressed air will compete with a steam pump in cost of operation. The exigencies of chemical and related manufactures, however, constantly require the handling of irregular volumes of liquid, involving a responsible and intelligent attendance that is becoming difficult and expensive to obtain.

The Metrolift will start when there is work to do and stop when the work is done; will turn on and shut off the power and record how much it has done.



METROLIFT—D622

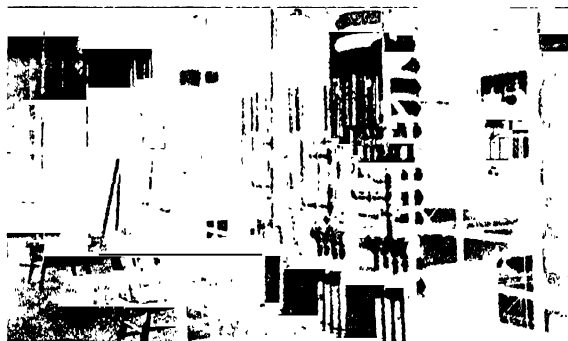
#### EXPERIMENTAL AND DEMONSTRATION APPARATUS

The increasing demand for apparatus to demonstrate processes and to be employed in checking manufacturing operations on a moderate scale has led to the development of a line of experimental plant intermediate between laboratory and manufacturing scales of operation. This line comprises standard units including Stills, Rectifiers, Condensers, Extraction Vessels, Tanks, and Accessories such as hand pumps and gauges, which permit setting up complete plant for the conduct of manufacturing operations on a small scale obtaining results that can be duplicated in full size plant. The unit system of construction enables us to supply this apparatus at moderate cost, and it is extensively used in universities, technical schools and private industrial laboratories. Standard Distilling, Rectifying and Extracting Outfits are available embodying all essential controls with piping and supports for installation. All standard units are designed for operation by steam at 15 to 100 pounds pressure above atmosphere.

Capacities of standard still units, 20 to 100 gallons. Tanks, 50 to 200 gallons. Other units in proportion.

#### TANKS

Standard storage tanks can be provided in steel, copper, wood, and glass or enamel lined, for any kind or quantity of volatile liquids, corrosive and neutral. Standard tank equipment includes manhole, self-closing gauge glass, filling and discharge connection, vent and vacuum relief valves. Special tanks for vacuum and high pressure work and for mixing, measuring and storage of volatile and fixed liquids and stock solutions. Constant head supply tanks and invariable flow gauges supplied for any required capacity.



CENTRALIZED REFINERY CONTROL—P138

#### ESTIMATES AND QUOTATIONS

Inquiries for prices and information should give complete information in respect to kind and quality of materials to be handled or products to be manufactured per day or hour and the number of hours per working day as well as any essential information concerning heat, power, water and transportation conditions.

The labor and time required to prepare estimates have been greatly increased by the general unsettlement of prices and we therefore request correspondents to state clearly whether rough estimates are desired or if definite quotations are justified by their intention to purchase—should prices prove satisfactory.

Correspondence in French and Spanish.

Telegraphic Code: A. B. C. 5th edition.

Cable Address: Lummus Boston.

# McDANEL REFRACTORY PORCELAIN COMPANY

Manufacturers of  
Refractory Porcelain Ware  
BEAVER FALLS, PENNSYLVANIA

## PRODUCTS

Vitrified porcelain ware of any shape and size, glazed or unglazed for use at any temperature your needs require up to 1600°C. Pyrometer tubes, protection tubes, insulating tubes and combustion tubes.

## FACILITIES

Our plant is fully equipped with the most modern equipment to meet any requirements of the users of vitrified porcelain apparatus.

## PYROMETER TUBES

Our tubes are produced from a very careful and scientific mixture of raw materials which gives us a product that will withstand all temperatures up to 1600°C., a very hard impermeable inert glaze covering, preventing deterioration under oxidizing or reducing conditions.

## SHIELD TUBES

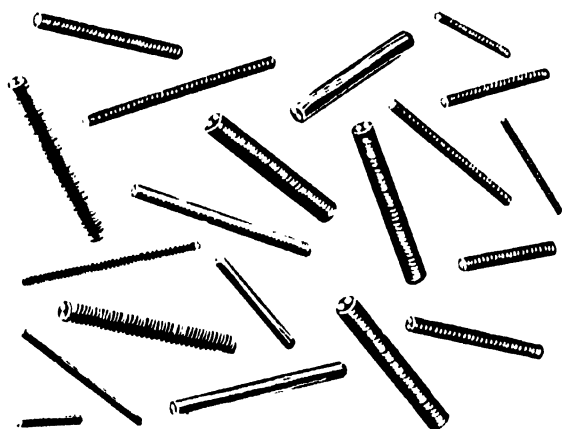
Made from standard materials to withstand most severe abrasive conditions and high temperature. We aim to meet the demands of various industries which in recent years have developed processes requiring higher temperatures than heretofore.

## INSULATING TUBING

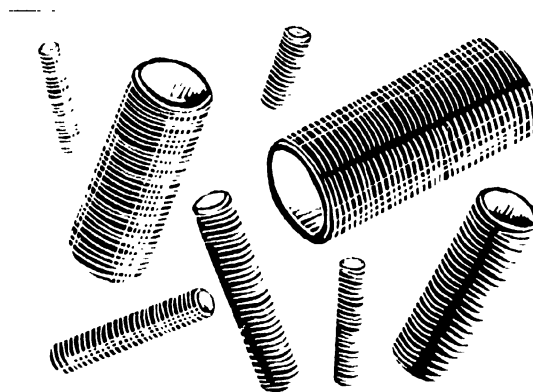
Any size and shape required, made from the same high temperature refractory bodies as the pyrometer tubes.

## COMBUSTION TUBES

Very high mechanical strength, gas-tight and withstand remarkable temperature changes. Very resistant to corrosive substances, such as oxides of lead, six months' continuous use in steel combustions in presence of lighterage has been brought to our attention.



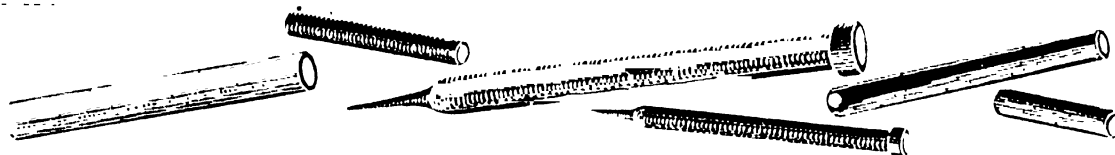
INSULATING TUBES



HEATING ELEMENT CORES



PYROMETER TUBES, GLAZED



COMBUSTION TUBES

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# A. C. MCGOWAN AND COMPANY

Dealers in

## Used or Reclaimed Burlap and Cotton Bags

206-208 W. Kinzie St.,  
CHICAGO, ILL.

---

### PRODUCTS

Used or reclaimed burlap and cotton bags.

### FACILITIES

This company has sources of obtaining a large supply of burlap and cotton bags which have been used but once and are in comparatively good condition. They are given careful individual inspection, are then graded and thoroughly machine-cleaned, put in first class condition, and assorted in sizes. All bags are guaranteed 100% usable.

### SERVICE

We shall be pleased to send samples of typical bags to those interested, and will furnish such information regarding sizes, ability to maintain a constant supply, etc., as may be desired.

Many important and nationally known manufacturers are using McGowan reclaimed bags, and express complete satisfaction with the service rendered to them by us over a period of years.

The use of the right kind of bag is a very important item of production. We are in position to render expert advice on this method of packing and transportation of a great variety of products.

### INFORMATION REQUIRED FOR MAKING ESTIMATES

We shall be glad to receive your inquiries. Those who write us should furnish as complete information as possible regarding the product to be bagged. The possession of this complete information has frequently enabled us to suggest a more economical package at a great saving in cost.

### USES

Many industries have made use of reclaimed bags at a great saving in cost of production. They have found that the bags furnished by us fulfill their purposes in every respect as well as would new bags.

Manufacturers who have not considered the use of reclaimed bags will find on investigation an interesting possibility in reducing the cost of production.

We specialize in bags for the various branches of the chemical and allied industries. The following are a few of the chemical products being successfully packed and shipped in reclaimed bags:

Agar-agar  
Aloes

Barks

Cardamoms  
Carnauba Wax  
Cement  
Chalk

Drug Leaves  
Drug Roots  
Drug Seeds  
Drug Twigs  
Dye-wood Chips

Fertilizers  
Flour

Glauber's Salt  
Gums

Limestone

Metals  
Minerals

Nut Shells

Rubber Scrap

Salt  
Sugar  
Sulfur

# MAGNESIA ASSOCIATION OF AMERICA

721 BULLETIN BUILDING, PHILADELPHIA, PA.

EXECUTIVE COMMITTEE: Wm. A. Macan, Chairman

George D. Cribbs, The Philip Carey Co., Cincinnati, Ohio  
Alvin M. Throck, Throck Magnesia Mfg. Co., Valley Forge, Pa.

J. R. Swift, The Franklin Mfg. Co., Franklin, Pa.  
R. A. Mattison, Jr., Kearsley & Mattison Co., Ambler, Pa.

Manufacturers of "85% Magnesia" Insulation for Power and Heating Systems

## PRODUCT

**"85% Magnesia"**—An inorganic, inert mineral composition, composed of eighty-five per cent. of commercially pure carbonate of magnesia, with which is incorporated sufficient mineral fiber to act as a binder, thus giving the necessary structural strength.

## APPLICATION

Not only can "85% Magnesia" be used throughout the chemical industries for all pipe lines, whether indoor or outdoor, but it can also be used for the insulation of valves, flanges and fittings. Many engineers do not cover these for fear they will not be able to get at them readily for repairs, etc. It must not be forgotten, however, that the heat-loss from a pair of heavy ten-inch flanges under high pressure is equal to over a ton of coal per year. Valve bodies, drips, steam-traps, the cylinders of duplex-pumps, in fact, every heated metal surface also waste large quantities of heat and should all be properly protected. Moreover, "85% Magnesia" can be used for the insulation of stills, evaporators, digesters, cookers, drying ovens, retorts, and all forms of heated chemical manufacturing equipment regardless of size or irregularity of surface.

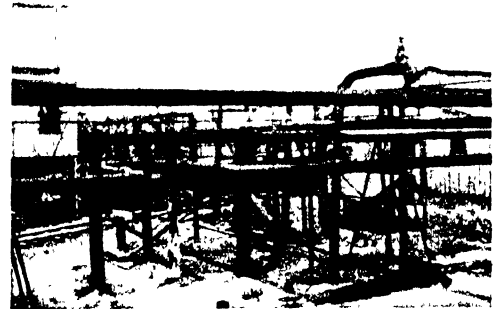


**"85% MAGNESIA" BLOCK AND SEGMENT COVERING AT SEABOARD BY PRODUCT COKE CO., JERSEY CITY, N. J.**

"85% Magnesia" is manufactured in the form of half sections, for pipes up to 10" diameter, segments for larger-sized pipes and curved surfaces, blocks for boilers and flat surfaces, and plastic (or fibrous powder) for irregular surfaces, filling of joints, etc.

## GENERAL SERVICE EXPERIENCE

The insulation value of "85% Magnesia" coverings is attested by the records of the largest industrial chemical concerns, such as E. I. du Pont de Nemours & Co., Seaboard By-Product Coke Co., Calco Chemical Co., Canadian Electro Products Co., etc., as well as by the records of over 30 years' experience in the U. S. Navy, the leading steamship lines, railroads, locomotive builders, power and heating plants and the largest hotels, public buildings, skyscrapers and other large structures in America and elsewhere.



**"85% MAGNESIA" ON OUTSIDE PIPE LINES, E. I. du PONT de NEMOURS & CO., CARNEY'S POINT, DEL.**

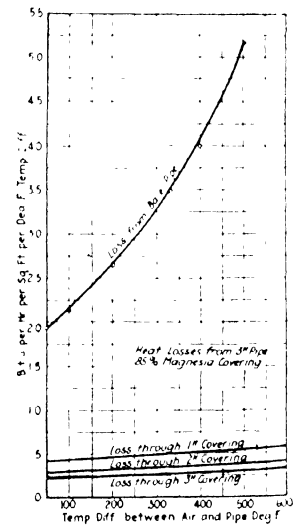
## EFFICIENCY

The heat saving efficiency of "85% Magnesia" is remarkable, being equal to from 80% to 90% of the heat that would be wasted by bare pipes.

By its use, the operation of outdoor pipe lines of indefinite length becomes possible, thus enabling an economical supply of steam from a central boiler plant and the piping of hot liquids from one portion of a large plant to another without loss of heat units.

## DURABILITY

Recent evidence of the great durability of "85% Magnesia" leads to the conclusion that there is no practical limit to its useful life, save that of the plant itself. It frequently happens that after removal from old steam pipes, the "85% Magnesia" coverings are replaced on new work. Even the small pieces of "85% Magnesia" that are broken up in connection with repairs can be ground and used again in plastic form with good results.



**HEAT LOSSES THROUGH "85% MAGNESIA" COVERINGS ON 3-IN. PIPE**

## MAGNESIA ASSOCIATION SPECIFICATIONS

Complete specifications can be had upon application to the Association.

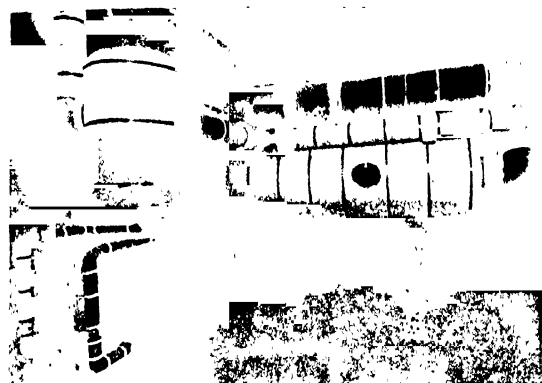
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## HEAT RESISTANCE

Like organic materials, "85% Magnesia" shows a tendency to deteriorate under prolonged contact with high temperatures such as those of superheated steam. The tendency is in the other direction. Several tests under continued temperature of from 500 to 900 F. have shown increased efficiency as great as 5 per cent.

## HANDBOOK

A practical handbook, "Defend your Steam," dealing fully with the manufacture, uses and application of "85% Magnesia" coverings and with the theory and practice of heat insulation, will be sent free on request.



"85% MAGNESIA" COVERINGS IN GREISS & PFLEIGER TANNERY, WAUKEGAN, ILL.

## EXPLANATION OF TABLES AND CURVES

The thicknesses given in these tables and curves are the proper thicknesses for the maximum net saving for each condition. They are based on a period of service of 8,760 hours per year. Where pipes are cold part of the year, multiply the cost of coal by the number of hours per year the pipes are hot and divide by 8,760, use the value obtained instead of the actual coal cost. Twenty per cent. of the list cost has been allowed as the cost of application, and 13% of the total cost for the annual fixed charges (6% interest, 5% depreciation, 2% miscellaneous). The values of the heat losses used in calculating the net savings are based on a series of experiments, covering a period of two years, made for the Magnesia Association of America by the Mellon Institute of Industrial Research of the University of Pittsburgh.

Table No. 2 is for use in plants where costs are not accurately known. They are based on average conditions. In transforming the steam-cost to coal-cost, it has been assumed that 75% of the cost of steam is coal cost, that one pound of coal will evaporate seven pounds of water, and that each pound of steam contains 1,000 B. T. U. above the feed-water temperature.

**How to Use the Tables**—Determine the following factors in connection with the heated surfaces to be covered: Cost of coal, steam-pressure and size of pipes.

Select the table most nearly corresponding to the cost of coal, and the column in the table nearest to the condition of steam-pressure or temperature. The thicknesses in this column are the proper thicknesses for the pipe sizes given at the left.

**Example**—Cost of coal \$375, steam pressure 150 lbs., size of pipe 12 in. Select the \$400 per ton table, and the column headed, "Steam 100-200 lbs." Run down this column to the 12-in. line and find that Double Standard (DS) is the proper thickness for maximum net saving.

**TABLE NO. 2—THICKNESS OF "85% MAGNESIA" FOR MAXIMUM NET SAVING**

S = Standard Thickness DS = Double Standard Thickness (See Table No. 1)

Cost At \$3.00 Per Ton						Cost At \$4.00 Per Ton					
Size of pipe, in.	Hot water 170° F.	Steam 100 lbs.	Steam 150 lbs.	200 lbs.	300 lbs.	Size of pipe, in.	Hot water 170° F.	Steam 100 lbs.	Steam 150 lbs.	200 lbs.	300 lbs.
1/2	S	S	S	1 1/2"	DS	1/2	S	S	S	1 1/2"	DS
3/4	S	S	S	1 1/2"	DS	3/4	S	S	S	1 1/2"	DS
1	S	S	S	1 1/2"	DS	1	S	S	S	1 1/2"	DS
1 1/4	S	S	S	1 1/2"	DS	1 1/4	S	S	S	1 1/2"	DS
1 1/2	S	S	S	1 1/2"	DS	1 1/2	S	S	S	1 1/2"	DS
1 3/4	S	S	S	1 1/2"	DS	1 3/4	S	S	S	1 1/2"	DS
2	S	S	S	1 1/2"	DS	2	S	S	S	1 1/2"	DS
2 1/4	S	S	S	1 1/2"	DS	2 1/4	S	S	S	1 1/2"	DS
2 1/2	S	S	S	1 1/2"	DS	2 1/2	S	S	S	1 1/2"	DS
2 3/4	S	S	S	1 1/2"	DS	2 3/4	S	S	S	1 1/2"	DS
3	S	S	S	1 1/2"	DS	3	S	S	S	1 1/2"	DS
3 1/4	S	S	S	1 1/2"	DS	3 1/4	S	S	S	1 1/2"	DS
3 1/2	S	S	S	1 1/2"	DS	3 1/2	S	S	S	1 1/2"	DS
3 3/4	S	S	S	1 1/2"	DS	3 3/4	S	S	S	1 1/2"	DS
4	S	S	S	1 1/2"	DS	4	S	S	S	1 1/2"	DS
4 1/4	S	S	S	1 1/2"	DS	4 1/4	S	S	S	1 1/2"	DS
4 1/2	S	S	S	1 1/2"	DS	4 1/2	S	S	S	1 1/2"	DS
4 3/4	S	S	S	1 1/2"	DS	4 3/4	S	S	S	1 1/2"	DS
5	S	S	S	1 1/2"	DS	5	S	S	S	1 1/2"	DS
5 1/4	S	S	S	1 1/2"	DS	5 1/4	S	S	S	1 1/2"	DS
5 1/2	S	S	S	1 1/2"	DS	5 1/2	S	S	S	1 1/2"	DS
5 3/4	S	S	S	1 1/2"	DS	5 3/4	S	S	S	1 1/2"	DS
6	S	S	S	1 1/2"	DS	6	S	S	S	1 1/2"	DS
6 1/4	S	S	S	1 1/2"	DS	6 1/4	S	S	S	1 1/2"	DS
6 1/2	S	S	S	1 1/2"	DS	6 1/2	S	S	S	1 1/2"	DS
6 3/4	S	S	S	1 1/2"	DS	6 3/4	S	S	S	1 1/2"	DS
7	S	S	S	1 1/2"	DS	7	S	S	S	1 1/2"	DS
7 1/4	S	S	S	1 1/2"	DS	7 1/4	S	S	S	1 1/2"	DS
7 1/2	S	S	S	1 1/2"	DS	7 1/2	S	S	S	1 1/2"	DS
7 3/4	S	S	S	1 1/2"	DS	7 3/4	S	S	S	1 1/2"	DS
8	S	S	S	1 1/2"	DS	8	S	S	S	1 1/2"	DS
8 1/4	S	S	S	1 1/2"	DS	8 1/4	S	S	S	1 1/2"	DS
8 1/2	S	S	S	1 1/2"	DS	8 1/2	S	S	S	1 1/2"	DS
8 3/4	S	S	S	1 1/2"	DS	8 3/4	S	S	S	1 1/2"	DS
9	S	S	S	1 1/2"	DS	9	S	S	S	1 1/2"	DS
9 1/4	S	S	S	1 1/2"	DS	9 1/4	S	S	S	1 1/2"	DS
9 1/2	S	S	S	1 1/2"	DS	9 1/2	S	S	S	1 1/2"	DS
9 3/4	S	S	S	1 1/2"	DS	9 3/4	S	S	S	1 1/2"	DS
10	S	S	S	1 1/2"	DS	10	S	S	S	1 1/2"	DS
10 1/4	S	S	S	1 1/2"	DS	10 1/4	S	S	S	1 1/2"	DS
10 1/2	S	S	S	1 1/2"	DS	10 1/2	S	S	S	1 1/2"	DS
10 3/4	S	S	S	1 1/2"	DS	10 3/4	S	S	S	1 1/2"	DS
11	S	S	S	1 1/2"	DS	11	S	S	S	1 1/2"	DS
11 1/4	S	S	S	1 1/2"	DS	11 1/4	S	S	S	1 1/2"	DS
11 1/2	S	S	S	1 1/2"	DS	11 1/2	S	S	S	1 1/2"	DS
11 3/4	S	S	S	1 1/2"	DS	11 3/4	S	S	S	1 1/2"	DS
12	S	S	S	1 1/2"	DS	12	S	S	S	1 1/2"	DS
12 1/4	S	S	S	1 1/2"	DS	12 1/4	S	S	S	1 1/2"	DS
12 1/2	S	S	S	1 1/2"	DS	12 1/2	S	S	S	1 1/2"	DS
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13 1/2	S	S	S	1 1/2"	DS	13 1/2	S	S	S	1 1/2"	DS
13 3/4	S	S	S	1 1/2"	DS	13 3/4	S	S	S	1 1/2"	DS
14	S	S	S	1 1/2"	DS	14	S	S	S	1 1/2"	DS
14 1/4	S	S	S	1 1/2"	DS	14 1/4	S	S	S	1 1/2"	DS
14 1/2	S	S	S	1 1/2"	DS	14 1/2	S	S	S	1 1/2"	DS
14 3/4	S	S	S	1 1/2"	DS	14 3/4	S	S	S	1 1/2"	DS
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15 1/4	S	S	S	1 1/2"	DS	15 1/4	S	S	S	1 1/2"	DS
15 1/2	S	S	S	1 1/2"	DS	15 1/2	S	S	S	1 1/2"	DS
15 3/4	S	S	S	1 1/2"	DS	15 3/4	S	S	S	1 1/2"	DS
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16 1/2	S	S	S	1 1/2"	DS	16 1/2	S	S	S	1 1/2"	DS
16 3/4	S	S	S	1 1/2"	DS	16 3/4	S	S	S	1 1/2"	DS
17	S	S	S	1 1/2"	DS	17	S	S	S	1 1/2"	DS
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18 3/4	S	S	S	1 1/2"	DS	18 3/4	S	S	S	1 1/2"	DS
19	S	S	S	1 1/2"	DS	19	S	S	S	1 1/2"	DS
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31 1/4	S	S	S	1 1/2"	DS	31 1/4	S	S	S	1 1/2	

# MAGNETIC MANUFACTURING COMPANY



**"High Duty" Magnetic Pulleys and Magnetic Separators  
And Special Magnetic Equipment**

MAIN OFFICE AND WORKS

788-790 WINDLAKE AVE., MILWAUKEE, WIS.

BRANCH OFFICES

New York  
Pittsburgh

Chicago  
Cleveland

Atlanta  
St. Louis

Cincinnati  
Los Angeles

Philadelphia  
Buffalo

## PRODUCTS

**"High Duty" Magnetic Pulleys, Magnetic Separators for all Foundries, "High Intensity" Magnetic Separators, Ore Concentrators for Wet and Dry magnetic concentration, Magnets and Magnetic Separators for all problems.**

### "HIGH DUTY" MAGNETIC PULLEYS

"High Duty" Magnetic Pulleys when used in grinding, crushing and pulverizing plants afford absolute protection to this equipment and aid in maintaining continuous production by eliminating delays and shut-downs which are caused by stray pieces of iron which break and seriously damage crushing machinery. These Magnetic Pulleys are made in all diameters and for all belt widths.



**MAGNETIC PULLEY AS DISCHARGE PULLEY FOR BELT CONVEYOR**

Note Scrap Iron Retained and Kept from Entering Crusher  
Send for Bulletin "No. 26"

"High Duty" Magnetic Pulleys are exceptionally powerful, in fact, are by direct comparison from 25 to 50% stronger than any other make of Magnetic Pulley of equal size. This increased strength is due to its superior design and construction as well as also to the ventilation of these pulleys, which affords  $2\frac{1}{2}$  times the radiating surface found on the enclosed type of Magnetic Pulley.

Magnetic Pulleys are easily installed in place of ordinary cast iron head pulley of a belt conveyor and where no belt conveyor is available, we usually furnish complete Magnetic Pulley Separators with bilge boards or self-feeding hoppers. Magnetic Pulley Separators are complete and self-contained units, and can be made for any pulley centers.

## HIGH INTENSITY MAGNETIC SEPARATORS AND ORE CONCENTRATORS

The concentration of ores and minerals can be accomplished economically by our "High Intensity" Magnetic Separators. Such ores as Zinc and Lead Sulphide, Wolframite, Sheelite, Chromite, Leucite, Manganese, Ilmenite, Garnet, Monazite, Nickel, Pyrite, Pyrrhotite, Chalcopyrite and Cassiterite lend themselves readily to Magnetic separation.

The lower power consumption, maintenance and labor charge together with a very high recovery of values, places the cost per ton of magnetic concentration considerably below that of other methods.

Magnetic Separation is very flexible and will fit into nearly every mill process in that these machines can be adapted to either wet or dry separation.



**"HIGH INTENSITY" MAGNETIC SEPARATOR**  
Send for Bulletin "D"

## MAGNETIC SEPARATORS

Our Type "L" Magnetic Separators are especially adapted in use in refining brass and aluminum borings and skimmings and are also used in refining abrasives and removing iron from other fine granular materials.

Type "F" Magnetic Separators are used in Gray Iron, Steel and Malleable Iron Foundries for reclaiming iron from sand and refuse. Net savings effected in iron recovered amounts to \$1.10 to \$1.40 per ton of melt per day.

## MAGNETS AND MAGNETIC SEPARATORS FOR ALL PROBLEMS

We are equipped to design and build special magnets and Magnetic Separators for such problems which cannot be solved by one of our standard types.

We maintain a laboratory for testing ores and minerals for their Magnetic susceptibility and make such tests gratis. We give our customers real engineering service which is backed by twenty years' experience in designing and building Magnetic Separators.

# MALCOLMSON ENGINEERING AND MACHINE CORPORATION

Manufacturers, Engineers, Contractors

NEW YORK

CHICAGO

ST. LOUIS

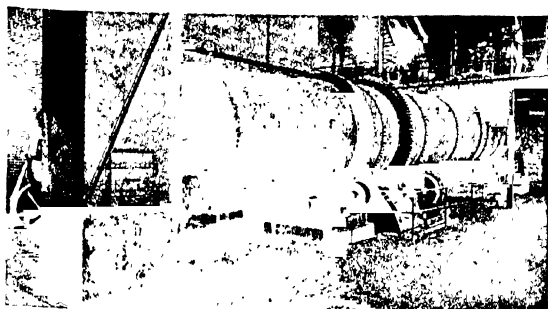
## SERVICES

Engineers and contractors for complete plants for briquetting; for low-temperature distillation of bituminous and lignite coals and peat; for drying, grinding and screening of all materials; and for the production of steam and electric power.

We have a complete shop equipped for the manufacture of briquetting presses, fluxers, mixers and special equipment for low-temperature distillation plants. We make complete investigations and reports.



KOMAREK BRIQUETTING PRESSES AND RUTLEDGE FLUXERS  
IN PLANT OF THE CLINCHFIELD CARBON COAL COR-  
PORATION, SO. CLINCHFIELD, VA.  
Capacity 20 tons per hour for each unit

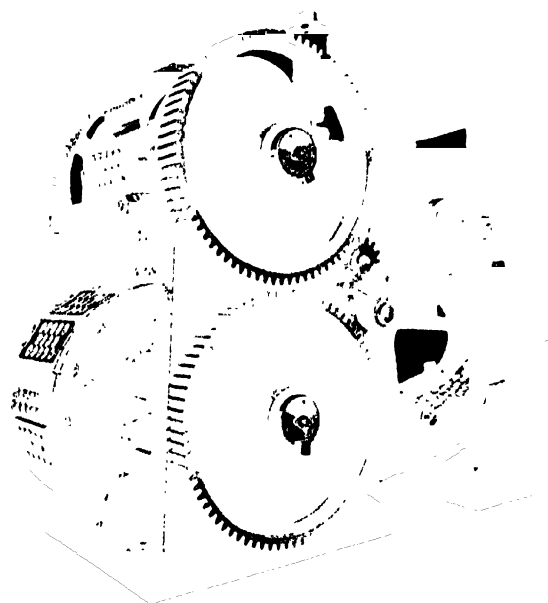


DRYING PLANT



IMPROVED ROLL PRESS

Capacities from 5 to 100 tons per hour for the manufacture of coal and other briquets



RUTLEDGE BRIQUETTING PRESS

Capacities from 25 to 150 tons per hour manufacturing cylindrical and rectilinear briquets.

# MANTIUS ENGINEERING CO., INC.

Consulting Engineers

15 East 40th Street

NEW YORK, N. Y., U. S. A.

## SERVICES

The design and construction of complete chemical plants and special machinery.

The development of new processes and the design of experimental plants and apparatus.

Estimates and specifications for the purchase of new equipment and supervision of its installation.

Appraisals of existing plants and their reorganization for greater efficiency.

Investigations and confidential reports on the practical and commercial value of manufacturing processes to owners, banks, or fiscal agents.

## GENERAL

More than twenty years' experience has given us valuable data for the design and construction of special machinery and complete chemical plants. Present conditions require economical machinery and efficient operation, and it is our aim to design the equipment so that it will meet the particular requirements of our clients. We have made a particular study of the efficient recovery of waste products, and are always glad to cooperate with our clients who wish to convert waste into profits.

We are prepared to furnish preliminary reports, layouts and estimates of complete plants or parts thereof, and after thorough study will supply detail plans and specifications for the purchase and erection of such plants, and give instructions and data for their operation. We have made a specialty of:

## EVAPORATORS

Our designs cover not only all standard types of vacuum and pressure evaporators made of cast iron, copper or steel, but particularly the construction of special types built of solid lead, lead lined, glass enameled steel, or glass, and heated with steam, hot oil, or electricity.

## DRYERS

We design drying systems to suit particular conditions, and after careful study of each problem. Also special dryers for delicate material, heated by electricity with perfect temperature control.

## DISTILLING APPARATUS

Special types working under atmospheric pressure or vacuum, and built of cast iron, copper, steel or glass enameled steel.

## CAUSTIC SODA AND POTASH PLANTS

We have designed complete plants and special equipment for the manufacture of these products from the basic raw materials, and have made a specialty of recovering these chemicals from various waste liquors (see flow sheet).

## MALT EXTRACT, MALTOSE AND YEAST

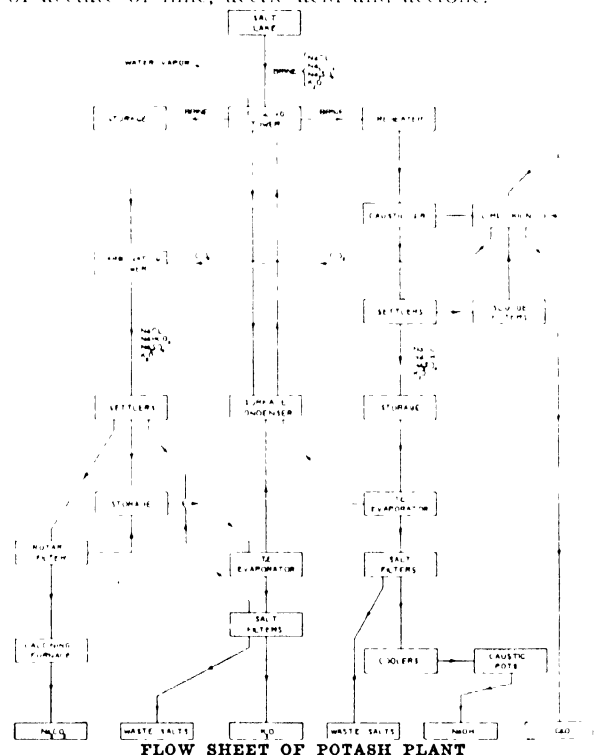
The last two years have shown a great activity in this particular field, and we have designed and installed a large number of plants for these valuable food products.

## SALT FROM SEAWATER

Our knowledge and experience in this particular line have enabled us to overcome successfully the difficulties that have to be met when concentrating large quantities of seawater for the production of salt. With our Multiple Effect Evaporators we produce salt of pure white crystalline water and pure table salt, our Multiple Effect Evaporators do not require cleaning and the salt is not contaminated by calcium sulphate.

## WOOD DISTILLATION

We are in position to build complete plants, and also special equipment for the economical manufacture of acetate of lime, acetic acid and acetone.



## BY-PRODUCT AND RECOVERY PLANTS

We invite our clients to write us regarding their particular problems as to the utilization of by-products and recovery of waste material. We have made a thorough study of this important branch of the chemical industry, and as an instance refer to the Simonson-Mantius Sludge Acid Recovery Process described on the following page.

## MISCELLANEOUS

While our work covers the whole field of the chemical and allied industries, we wish to mention a few products for which we have designed special machinery: Sodium and Potassium Chlorides, Chlorates and Sulphates, Ammonium Salts, Zinc Chloride, Sodium Sulphide, Black Liquor and Sulphite Waste, Milk and its products, Dyewoods and Extracts, and others.

*Continued on Next Page*



## SLUDGE ACID RECOVERY

The **Simonson-Mantius Process** (patent pending) has been developed after careful study of the defects of existing plants, and in this process the separated acid of from 30° to 35° Bé. is concentrated under high vacuum to 65° Bé., using steam at 150 lbs. pressure as heating medium, or to 66° Bé. by the use of hot oil. At the low temperatures prevailing in the apparatus, practically no acid is destroyed, and **no fumes** can escape into the atmosphere, as the small amount given off during the final concentration is absorbed by the cooling water in the condenser.

The organic matter is not burned but becomes insoluble during the concentration, and if objectionable can be removed by filtration. Radiation losses are very small and fuel consumption is low on account of the acid being concentrated in a closed system at low temperature. It has been found that 65° acid with 90% acidity is entirely suitable for the chemical treatment of oils, but if necessary, the density may be raised to 66° (93% acidity) by adding a small quantity of fuming acid. Many refineries operate their boilers at 150 lbs. pressure, and therefore will not require an oil heating equipment.

## OPERATING EXPENSES

A plant recovering 20 tons of acid in 24 hours requires about 25 bbls. of fuel oil, or 6.3 tons of coal, and one man can operate from one to three units at the same time if conveniently located. The power consumption does not exceed 300 K.W. hours, and repairs are about 50c. per ton. The total operating expenses including charges for overhead, depreciation and interest will vary from \$6 to \$8 per ton, depending on local conditions, and the size of the plant.

## Fundamental Reasons

why the **Simonson-Mantius Process** should be used for reclaiming waste acids:

- No fumes and bad odors
- Low first cost
- Low depreciation
- Reduced operating expenses
- High efficiency
- Small floor space required

## APPARATUS

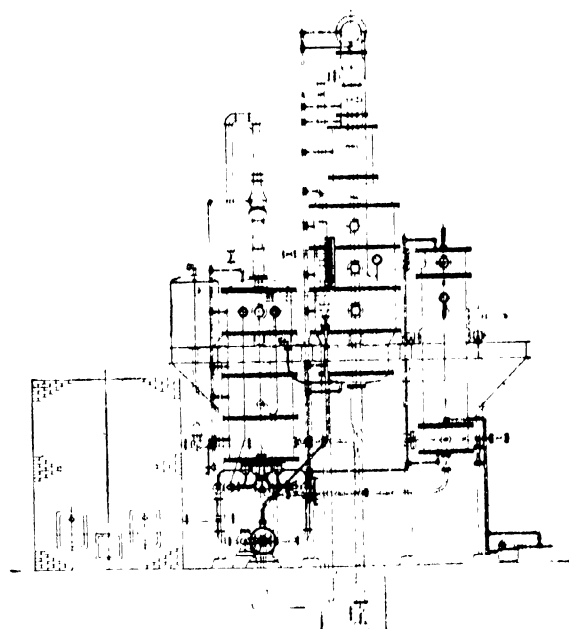
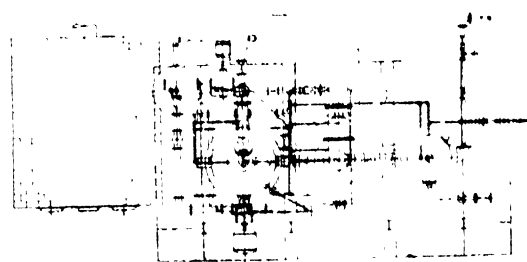
The general arrangement of a 20-ton unit is shown in illustration, and the two types of evaporators used in the Simonson-Mantius Process have been employed for many years in the chemical industry for similar purposes. There are no losses by foaming and entrainment, and all parts coming in contact with the acid are lined with heavy sheet lead by a special process. The acid is finished to 65° or 66° Bé. in an apparatus similar to the well-known Mantius High Concentrator, equipped with Duriron tubes. All accessories are especially designed for this particular work in order to reduce repairs and operating expenses.

The machinery requires only a small floor space and frequently existing buildings may be utilized. A 20-ton plant for instance will occupy only a space of about 400 square feet, and a 50-ton unit about 550 square feet.

Sludge Acid Recovery Plants working under the Simonson-Mantius Patent are built in sizes of from 5 to 50 tons daily capacity.

## EXPERIMENTAL PLANT

We place at the disposal of our clients a well-equipped experimental plant, and are prepared to demonstrate and work out this process for each particular sludge acid. We require at least one barrel of separated acid for such a test, and there will be no charge for this service.



20-TON RECOVERY PLANT

## WHITE ACID

In refineries where it is not desirable to use the black acid again in the process, we can furnish additional equipment that will remove the organic matter before the final concentration, and furnish a pale yellow or white acid of 65° or 66° Bé. In this case the operating expenses will be from \$1 to \$1.50 per ton higher.

The **Simonson-Mantius Process** is owned by W. H. Simonson, of the American Lead Burning Co., Inc., 30 Church Street, New York City, and Otto Mantius, of the Mantius Engineering Co., Inc., 15 East 40th Street, New York City.

# THE MANHATTAN RUBBER MFG. COMPANY

EXECUTIVE OFFICES AND FACTORIES

PASSAIC, N. J.

## BRANCHES

New York, N. Y.  
Pittsburgh, Pa.  
Columbus, Ohio

Chicago, Ill.  
New Orleans, La.  
El Paso, Tex.  
Portland, Ore.

Boston, Mass.  
Birmingham, Ala.  
Kansas City, Mo.  
Salt Lake City, Utah

Baltimore, Md.  
Atlanta, Ga.  
Minneapolis, Minn.  
San Francisco, Calif.

St. Louis, Mo.  
Cleveland, Ohio  
Seattle, Wash.  
Spokane, Wash.

Buffalo, N. Y.  
Detroit, Mich.  
Tulsa, Okla.

## PRODUCTS

Rubber Lined and Covered Sheet Steel Tanks, Boxes, Flanges, Nipples, Elbows and Tees—also Pipe from 1 in. up, lengths to 15 ft.

Blowers, Exhausters, Fans and Special Construction of all kinds Rubber lined and covered to order.

Belting—Drive, Conveyor, Elevator and Concentrator, including the Celebrated "Condor" Belt.

Acidproof Belts for use where Fumes Obtain.

Hose—For Water, Steam, Air, Vacuum, Oil, Chemicals, Etc.

Packing—A complete line of sheet, spiral and molded packings for every purpose; gaskets, rings, Etc.

Molded Rubber Goods—Pump Valves, Beet Sugar Specialties, Filter Press Rings, Evaporator Rings, Ball Valves, Diaphragms, Etc., and Special Parts made to order.

## MOLDED GOODS AND SPECIALTIES

We have exceptional facilities for making rubber goods of special or irregular shape, necessitating their

being made in molds. These are almost endless in variety, entering as they do into practically every industry. Estimates and samples cheerfully submitted.

## RUBBER LINING

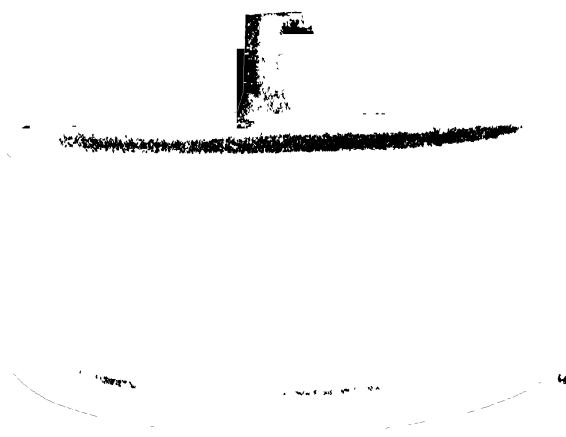
The lining of sheet steel tanks and other equipment with rubber is an operation requiring long experience and expert workmanship. We have been doing work of this character for a long time for many of the largest concerns in the chemical industries and for some of the leading manufacturers of industrial chemical equipment—for instance, we line and cover Centrifugal Baskets and line the container in which the basket revolves for several of the largest makers of these machines. Centrifugal Extractor Baskets and Tubs from 16 inches to 60 inches.

## SPECIAL WORK TO ENGINEERS' DRAWINGS

We are always pleased to examine drawings of equipment of parts which chemical engineers think could be lined with rubber to advantage. We will advise as to the practicality of doing so and submit an estimate of the cost.



RUBBER LINED PIPE AND FITTINGS



RUBBER LINED AND COVERED CENTRIFUGAL EXTRACTOR BASKET



RUBBER LINED CENTRIFUGAL EXTRACTOR CONTAINER

## SLUDGE ACID RECOVERY

The **Simonson-Mantius Process** (patent pending) has been developed after careful study of the defects of existing plants, and in this process the separated acid of from 30° to 35° Bé. is concentrated under high vacuum to 65° Bé., using steam at 150 lbs. pressure as heating medium, or to 66° Bé. by the use of hot oil. At the low temperatures prevailing in the apparatus, practically no acid is destroyed, and **no fumes** can escape into the atmosphere, as the small amount given off during the final concentration is absorbed by the cooling water in the condenser.

The organic matter is not burned but becomes insoluble during the concentration, and if objectionable can be removed by filtration. Radiation losses are very small and fuel consumption is low on account of the acid being concentrated in a closed system at low temperature. It has been found that 65° acid with 90% acidity is entirely suitable for the chemical treatment of oils, but if necessary, the density may be raised to 66° (93% acidity) by adding a small quantity of fuming acid. Many refineries operate their boilers at 150 lbs. pressure, and therefore will not require an oil heating equipment.

## OPERATING EXPENSES

A plant recovering 20 tons of acid in 24 hours requires about 25 bbls. of fuel oil, or 6.3 tons of coal, and one man can operate from one to three units at the same time if conveniently located. The power consumption does not exceed 300 K.W. hours, and repairs are about 50c. per ton. The total operating expenses including charges for overhead, depreciation and interest will vary from \$6 to \$8 per ton, depending on local conditions, and the size of the plant.

## Fundamental Reasons

why the **Simonson-Mantius Process** should be used for reclaiming waste acids:

- No fumes and bad odors
- Low first cost
- Low depreciation
- Reduced operating expenses
- High efficiency
- Small floor space required

## APPARATUS

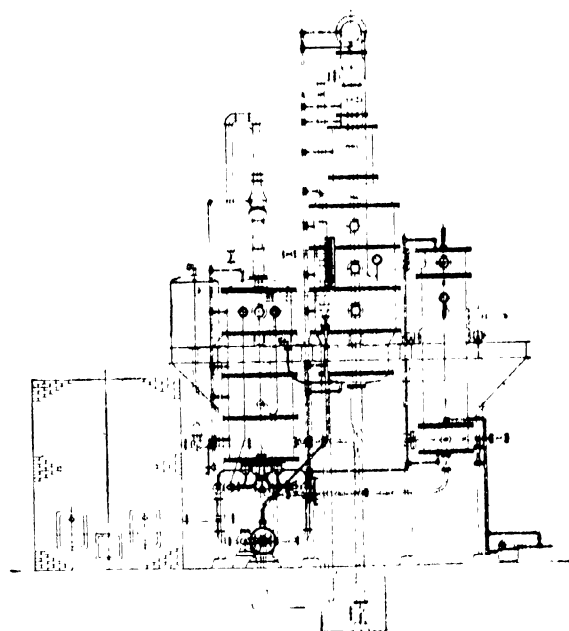
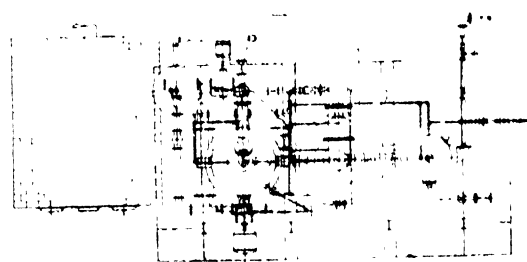
The general arrangement of a 20-ton unit is shown in illustration, and the two types of evaporators used in the Simonson-Mantius Process have been employed for many years in the chemical industry for similar purposes. There are no losses by foaming and entrainment, and all parts coming in contact with the acid are lined with heavy sheet lead by a special process. The acid is finished to 65° or 66° Bé. in an apparatus similar to the well-known Mantius High Concentrator, equipped with Duriron tubes. All accessories are especially designed for this particular work in order to reduce repairs and operating expenses.

The machinery requires only a small floor space and frequently existing buildings may be utilized. A 20-ton plant for instance will occupy only a space of about 400 square feet, and a 50-ton unit about 550 square feet.

Sludge Acid Recovery Plants working under the Simonson-Mantius Patent are built in sizes of from 5 to 50 tons daily capacity.

## EXPERIMENTAL PLANT

We place at the disposal of our clients a well-equipped experimental plant, and are prepared to demonstrate and work out this process for each particular sludge acid. We require at least one barrel of separated acid for such a test, and there will be no charge for this service.



20-TON RECOVERY PLANT

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# MARSHALL RIEHA, INC.

Importers, Manufacturers' Agents, Exporters

882-884 PARK AVENUE, BALTIMORE, MD., U. S. A.

## PRODUCTS

Chemical Plant and Laboratory Supplies.

## BUSINESS

The business of Marshall Rieha, Inc., was established as a supply house for the chemical and allied industries of the Middle and Southern Atlantic States.

## INDUSTRIAL CHEMICAL DEPARTMENT

Aluminum Sulphate. For water purification.  
Barium Salts.  
Bleaching Powder.  
Calcium Chloride. Granular and flaked.  
Caustic Soda.  
Copper Salts.  
Isopropyl Alcohol.  
Lead Salts.  
Manganese Dioxide.  
Nickel Salts.  
Potassium Permanganate. Technical and U. S. P.  
Resorcin. Technical. "Penacol" brand.  
Soda Ash.  
Sodium Bicarbonate.  
Sodium Sulphide. Solid fused and broken pieces.  
Zinc Salts.

## FINE CHEMICAL DEPARTMENT

Benzaldehyde. U. S. P.  
Ethyl Ether. All grades.  
Absolute distilled over sodium.  
U. S. P.  
Marshall's Anæsthesia.  
Distilled Iodine. A new product of highest purity for reagent work, supplied either in bulk or small quantities.  
Phenol. U. S. P.  
Resorcin. U. S. P. "Penacol" brand.  
Reagent and C. P. Chemicals. Stocked and supplied in the following makes:  
J. T. Baker Chemical Co.  
Baker & Adamson.  
Powers-Weightman-Rosengarten Co.  
U. S. Industrial Chemical Co.

## DENATURENT DEPARTMENT

All special formula denaturents for industrial alcohol. The materials supplied for denaturent work meet the specifications of the Treasury Department.

## APPARATUS DEPARTMENT

For Chemical Plants:

Centrifugal Acid Pumps for Sulphuric Acid. Types are offered suitable for all strengths and for a wide range of volume capacities. These pumps can be supplied with wearing parts of:

Monel Metal, for weak acid.

Hard Lead, for 50° Bé. and 60° Bé. acid.

Cast Iron, for 66° Bé. acid.

Acid Proof Cements.

Acid Proof Paints.

Acid Proof Stoneware.

"Obsidianite." An acid proof refractory.

Beach-Russ Vacuum Pumps.

Rubber Gloves, and other acid plant accessories.

For Laboratories:

Balances.

Calorimeters.

"Coors" Porcelain.

Electric Furnaces.

Fused Silica Apparatus.

Gas Furnaces.

Graduated Glassware.

Hydrometers.

Laboratory Blowers.

Laboratory Vacuum Pumps.

Pyrex Glassware.

Thermometers.

"Whatman" Filter Paper.

We specialize in the supply of laboratory meta apparatus to customers' designs.

## SPECIAL CHEMICAL PRODUCTS

As a result of our connections with a number of chemical manufacturers, we are frequently able to arrange for the production of special chemicals not usually marketed. We welcome inquiries along this line.

## SLUDGE ACID RECOVERY

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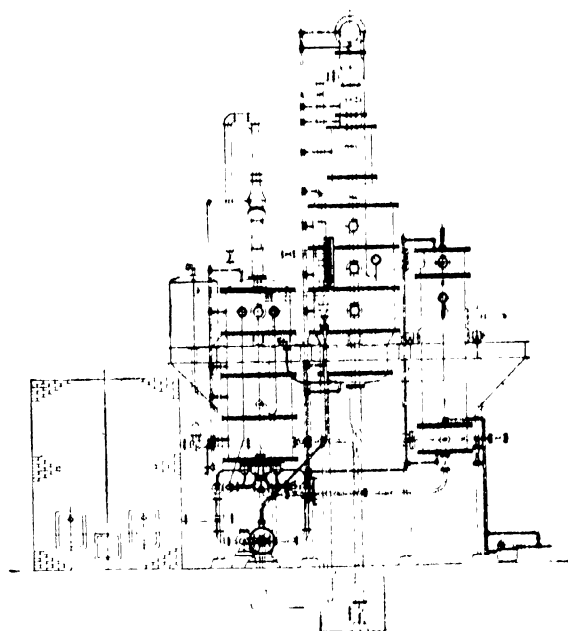
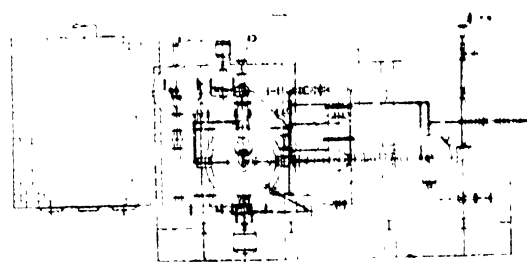
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# MAYER TANK MANUFACTURING CO., INC.

Manufacturers of Wooden Tanks

OFFICE AND WORKS

Telephone  
DUFF GREENPOINT

212-220 RUSSELL STREET, BROOKLYN, N. Y.

## PRODUCTS

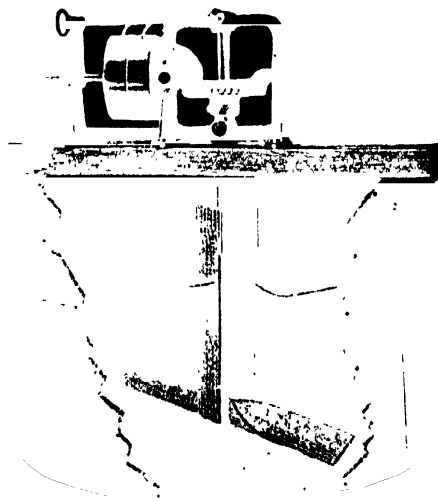
Wooden Tanks, Vats and Drums in any shape for any purpose; Round, Oval, Square, Rectangular, or special shapes for:

Chemical Plants	Color and Dye
Bleacheries	Paint and Varnish and
Dye Houses	other works
Tanneries	

## MAYER ROUND WOOD MIXING TANK

Made entirely of cypress, the best wood for tanks used for most purposes throughout the chemical or other fields.

**Bottom of Tank**—Tank built with a sloping solid bottom, the inside of bottom slopes at a sufficient angle to allow sediment to be readily removed without tipping the tank, the exterior of bottom is in an absolute horizontal plane, tank standing always in a true vertical position.



MAYER ROUND WOOD MIXING TANK

**Tank Walls**—Cypress staves (well seasoned) vary in width from 5 to 8 inches and are held together by means of dowel pins.

**Hoops**—Tanks are bound with hoops of refined round iron with lug attachments. Hoops furnished as specified.

**Dimensions**—Mayer tanks can be made in heights of 6, 7 or 8 feet, as required; diameters range from 4 to 10 feet or larger, as desired; thickness of staves vary according to requirements—4", 3", 2½" or 2". Made in heights and widths to meet all conditions.

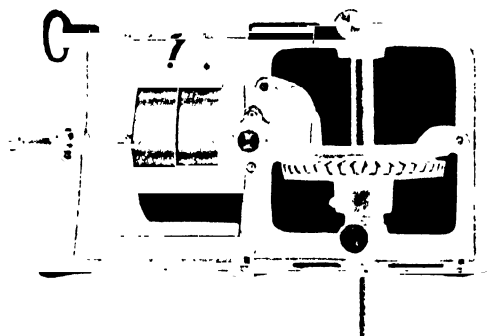
## STOCKS OF WOOD FOR TANKS

We carry at all times a stock of tank lumber, Cypress, Oak, Cedar, Oregon Fir, etc.

We also have a large number of Brewery tanks in stock that we can remodel to any size required, and through experience find that they answer the same purpose as new with at least a 25% saving.

## AGITATORS

We build many designs of agitators used for stirring or mixing liquids in wood tanks. We have a design of agitator that will handle efficiently any liquid, whether pasty, gummy or viscous.



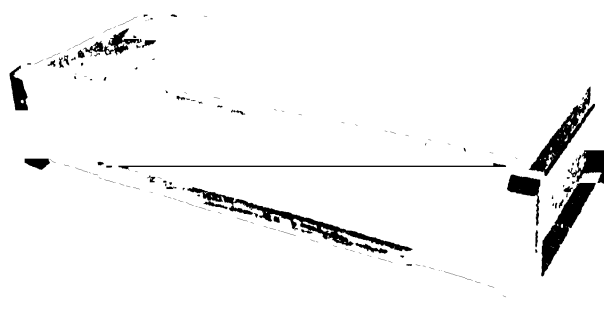
AGITATOR MECHANISM

## MAYER RECTANGULAR WOOD TANKS

Made of cypress, with or without partitions, false bottoms, etc. Used for any purpose where chemicals are handled, for galvanizing work of any kind, etc.

The standard rods are of refined round iron, ½ to 1" in diameter and suitable for the heaviest work, sizes of rods and spacing of same give a full factor of safety of 4 to 1. No bulging is possible.

Rods made of brass, copper, bronze, galvanized, lead-covered or other acid-resisting material, as desired.



MAYER RECTANGULAR WOOD TANK

## EXPERIENCE

We have been building tanks for the industries for over 20 years, and in that time have supplied the wants of some of the largest manufacturers in the chemical and allied industries, over this long period of years.

We equipped the Brooklyn plant of the National Ammonia and Chemical Co. throughout, totaling about 150 tanks, of all sizes, and have executed similar large contracts for other manufacturers.

Our long experience in supplying the wants of these industries is at your service. Write us for quotations.

# MEAD & COMPANY

Manufacturers of the Mead Mill

DETROIT, MICHIGAN

## PRODUCT

The Mead Mill, for Grinding and Pulverizing Drugs, Chemicals, Dry Colors, Dyestuffs, Sugar, Glue, Gelatin, Spices, Rosin, Asphaltum, Pitch, Asbestos, Chicle, etc.

## MEAD MILL

We have specialized on this one type of mill, perfecting it in every detail until we now have what everyone believes is the best mill on the market from the point of efficiency, durability and simplicity of construction.

**Performance**—Records prove that with the same amount of power units consumed, our mill will grind larger volume of material in a shorter space of time than any other mill on the market.

**Simplicity**—Owing to the simplicity of construction there is practically no danger of the Mead Mill getting out of adjustment.

**Description**—This grinder is the high-speed disc type reducing the materials by impact, a vast improvement over the friction method. A Jesop steel disc bears hand-forged tool steel beaters which revolve inside corrugated rings. These beaters catch the material as it enters the feed side and beat it against the corrugations until it is fine enough to pass between the disc and the ring. The material is then on the discharge side of the machine, and all that is fine enough is forced through the screens by the beaters on the back of the disc. The remaining material is caught up by the back beaters on disc and beaten against the screens until it is fine enough to pass through. The ground material is discharged through the opening in the bottom of the mill into a discharge box, hopper, or into the room below.

**Screens and Blanks**—For each size mill we make three grades of screens—fine, medium and coarse. Two sections of screen are placed in the groove in the lower half of the mill, and a screen and a blank in the upper half of the mill, thus completing circle around revolving disc.

The blank is corrugated but has no openings, and is used to retain the material in the mill longer, thus increasing the degree of fineness.

**Fineness of Grinding**—The degree of fineness to which the material can be ground depends first on the speed of the mill, and the number and kinds of screens used.

**Materials Ground**—The Mead Mill will grind practically any material desired. It can be arranged to grind gummy, sticky, soft materials. It is used largely in grinding gum chicle.

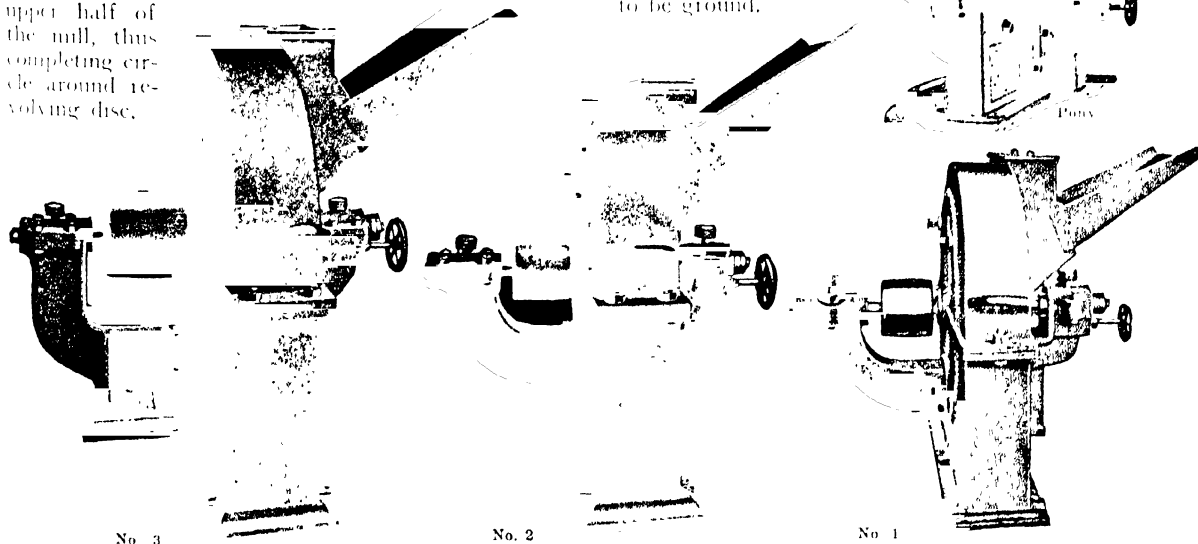
**Interchangeability**—All Mead Mills of one size are alike, with interchangeable parts. One of the strongest features of our mills is the fact that duplicate parts can be obtained at short notice. As the beaters are the most liable to wear, by providing a spare disc, the disc can be quickly replaced, thus stopping the mill for a minimum of time. We have special machinery for making and drilling the beaters uniformly and can furnish them ready to attach.

## DATA OF MEAD MILLS

The capacity with screens of 100 mesh.

Mill	Dimensions			Horse power required	Speed—R.P.M.
	Length	Width	Height		
Pony	14"	14"	14"	1	2,000
No. 1	24"	24"	24"	3	1,000
No. 2	36"	36"	36"	5	750
No. 3	48"	48"	48"	10	500

**Pony Mill**—This little mill was designed to meet the universal demand for a perfect laboratory and small production grinding and pulverizing mill. This mill will reduce soft products, also hard and brittle materials very readily. The degree of fineness can be varied by the use of three sizes of screens or sieves. Capacity ranges from 25 to 100 lbs. per hour, depending on the material to be ground.



ILLUSTRATING COMPARATIVE SIZES OF MEAD MILLS

# RICHARD K. MEADE & CO.

Chemical and Industrial Engineers  
11 E. FAYETTE ST., BALTIMORE, MD.

ANALYTICAL LABORATORY 11 E. CLAY ST.

EXPERIMENTAL PLANT Yorktown, Va

## SERVICES

Design and Construction of Lime Plants, Cement Mills; Plaster Plants; Fertilizer and Chemical Works; Lithopone and Potash Plants.

Design and Installation of Rotary Kilns; Chemical Furnaces; Complete Oil and Pulverized Coal Burning Systems; Crushing, Grinding and Pulverizing Plants; Material Handling and Storage Systems; Drying Systems and Dust Precipitation Apparatus.

Reports (Covering fiscal as well as technical possibilities) upon mineral deposits, processes, etc.

Chemical Research and Investigation on a semi-commercial scale of new processes.

## GENERAL

We offer the chemical industries an organization skilled in design and construction, combined with expert chemical knowledge.

We undertake all work connected with the building of plants including preliminary studies, layouts and estimates, complete detail plans and specifications for the erection of such plants and instructions for their operation.

Plants and Equipment designed by us are especially adapted to meet specific requirements. We believe that only after a thorough study of the problem can best results be obtained.

We maintain complete research laboratories and an experimental plant.

## LIME, HYDRATED LIME AND PLASTER PLANTS

We design lime kilns for burning coal, oil, or producer gas; of vertical (steel or reinforced concrete construction) or rotary type, and complete hydrated lime and plaster plants. Our design is always based on local conditions and a careful study of the raw materials and the character of the product desired. As a result of this study our plants are efficient, because the equipment we recommend is exactly suited to the requirements.

We make a specialty of plants for recovery of lime from waste carbonate of lime from caustic soda, paper pulp, etc.

## PORTLAND CEMENT MILLS

Our work in this industry, with which Mr. Meade's name is so intimately connected, consists in the design and construction of new plants, remodeling and enlargement of old plants, investigation of deposits of raw material and expert advice as to improvement of product or increase and economy of production.



PLASTER PLANT, CONNECTICUT ADAMANT PLASTER CO., NEW HAVEN, CONN.

## ROTARY KILNS AND INDUSTRIAL FURNACES

We have designed installations for roasting and nodulizing copper concentrates, flue dusts, ores and findings; desulphurizing and nodulizing iron ores and pyrite cinder; for making various chemicals.

We are in a position to demonstrate and work out these processes in our experimental 2' diam. x 20' long rotary kiln.

We also specialize in muffle, reverberatory and rotary batch furnaces for chemicals such as barium sulphide, lithopone, bichromate, muriatic acid, silicate of soda, etc.

## PULVERIZED COAL AND OIL BURNING SYSTEMS

We have had twenty years' experience in the use and application of pulverized coal and oil to heating industrial furnaces, boilers, etc.

We are always glad to advise manufacturers as to the heating of their equipment.

## DRYING SYSTEMS

We are prepared to make a study of drying problems and to design dryers especially suited to various materials. We have designed dryers of all types, direct, indirect, closet, tunnel, air, etc.

## CRUSHING PLANTS

We make a specialty of plants for crushing ores, minerals, granite, trap rock, limestone, etc., and for pulverizing limestone for agricultural purposes, feldspar for pottery, ores, gypsum, talc, etc.

## MISCELLANEOUS

We have designed plants for liquid carbon dioxide, potash recovery from cement kilns, whiting, lithopone, barium sulphide, carbonate and blanc fixe, kaolin washing, potash from green sand, etc.

## A FEW CLIENTS

Alpha Portland Cement Co	Marden, Orth & Hastings Corp
American Cyanamid Co	Mineral Refining & Chemical Corp.
Clinchfield Portland Cement Corp	Mutual Chemical Co.
Connecticut Adamant Plaster Co	National Lead Co.
Dow Chemical Co	Oakland Chemical Co.
Dutchess County Lime Co.	Pennsylvania Salt Mfg Co
Eastern Potash Corp	Solvay Process Co
Hercules Cement Corp.	Rumford Chemical Co
Herr & Frerichs Chemical Co	Union Carbide Co
Ladd Lime & Stone Co.	U. S. Industrial Alcohol Co



LIME KILNS AND HYDRATING PLANT  
LADD LIME & STONE CO., CARTERSVILLE, GA.



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# MEIGS, BASSETT & SLAUGHTER, INC.

Chemical Engineers

210 South Thirteenth Street

PHILADELPHIA, PA.

Cable Address  
"CHEM ENG." Philadelphia

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## SERVICES

**"From Research to Plant in Operation."**

Specialists in the design and construction of Sulphuric Acid, Nitric Acid, Muriatic Acid, Phosphoric Acid Plants and plants for the production of Potash and Fertilizer Salts. We are prepared to furnish expert engineers for the superintendence of construction and can also supply men thoroughly trained in the operation of such plants.

Industrial reports as a basis for financing.

## CONSULTING ENGINEERING SERVICE

We have nothing to sell but our services and act as consulting engineers from "research to plant in operation." We have a large and well trained corps of engineers and chemists who are familiar with all branches of chemical industry but have specialized in the heavy mineral acids and chemical salts.

If you will submit us your problems, we will be glad to investigate their possibilities through our research department, perfect the process, and design a suitable plant to carry out the operation, instructing your operators in the work.

Our research laboratory at Bala, Pennsylvania, is fully equipped to handle problems relating to the in-

vestigation of acids, alkali salts, salt separation, cotton purification and caustic recovery, cotton nitration, lacquers, celluloid, artificial leathers, etc.

We have a complete furnace equipment for roasting problems together with leaching and evaporating for the manufacture and recovery of metal salts as sodium sulfide, barium carbonate and strontium salts.

## WORK COMPLETED

Typical of the work recently done by this company we mention the following:

Industrial Survey and Complete Report on the Old Hickory Powder Plant as a basis for its development as an industrial center.

Thorough exploration, tests, development of processes and complete report on two large potash developments.

Design and Construction of

60 Ton Contact Sulphuric Acid Plant.

6 Retort Nitric Acid Plant

Complete 9 Wringer Cotton Nitrating Plant.

Complete Artificial Silk Plant for manufacture of 10,000 pounds daily with ether-alcohol, collochon mixing, filtration, spinning, twisting and skimming, denitration, solvent recovery, power plant, etc.

# MERRICK SCALE MANUFACTURING CO.

The Weightometer  
PASSAIC, NEW JERSEY

## PRODUCT

The Weightometer for automatically weighing and registering the weight of all material in transit over a belt, bucket or pan conveyor.

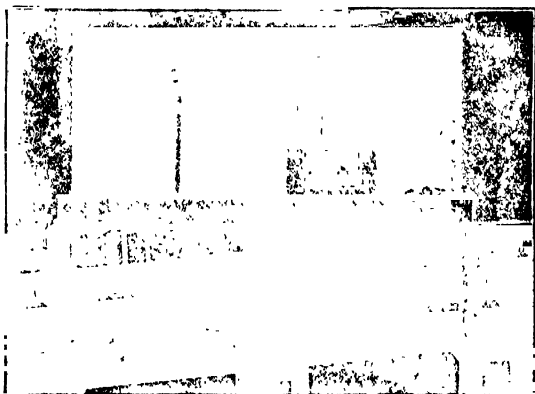
## DESCRIPTION

The Weightometer consists of a pair of weighing levers, and a steelyard or beam, similar to that of the platform scale, but of special design, so that a short section of the conveyor can be suspended from the weighing levers. The load on this suspended portion, however distributed, is always automatically counterbalanced by the buoyancy of a cylindrical iron float immersed in a mercury bath and suspended from the long end of the weighing beam. This float allows the beam to move from its position, when the conveyor is empty, in exact proportion to the weight of material on the suspended portion of the conveyor at any moment. A mechanical integrator totalizes the movement of the beam, with a factor obtained from the travel of the conveyor by means of suitable gearing from the bend pulley or sprocket wheel. The result obtained from the product of two quantities, one proportional to the weight of the material suspended and the other to the travel, therefore represents accurately the total weight of material moved. This is plainly indicated, by a register, in units and decimals of either a short ton, long ton, metric ton or other desired units.

## ACCURACY

This company guarantees, when this machine is erected and operated in accordance with instructions, that the accuracy shall be within 99% of the actual weight of material carried over the conveyor at a rate of not less than one-half of the maximum capacity for which the Weightometer is designed. This is not limited to a uniform continuous load, as portions of the conveyor may be loaded to full capacity of the Weightometer with empty portions intervening.

In testing, at least sufficient material must pass over the conveyor to register 5 or more unit figures on the counter.



VIEW OF WEIGHTOMETER ON BELT CONVEYOR  
Front Sheet of Casing Removed



TYPICAL INSTALLATION OF MERRICK CONVEYOR  
WEIGHTOMETER

## USE

Wherever a conveyor can be used to convey bulk material, a Weightometer installed on this conveyor will weigh on the fly all of the material which passes.

Chemical, Cement, Power, Gas Plants, Paper Mills, Mines, Stone Quarries, weigh their raw and finished product, using the Weightometer weights for production and consumption records as well as for checking in and billing out weights.

## REGISTRATION

Weight to be registered by 5-figure counter in tons of 2,000 lbs. and decimal thereof, unless otherwise requested. Registration can be made in other units, as long tons, metric tons, barrels of a certain number of pounds, etc.

## ESSENTIAL FEATURES

The important advantages of the Merrick Weightometer are: easy installation; automatic operation; no expense for attendance; durability; simplicity; sheet iron enclosure for all working parts, thereby eliminating exposure to dust and interference by tampering; weighing without interruption of conveyor service, and a high degree of accuracy, whether the load be intermittent or uniform.

# THE MERRILL COMPANY

GENERAL OFFICES  
121 SECOND STREET, SAN FRANCISCO, CALIF.

EASTERN OFFICE  
50 Church Street, New York, N. Y.

FACTORY AND GENERAL EASTERN SALES OFFICE  
Monadnock Building, Chicago, Ill.

SALES OFFICES

Cleveland  
Detroit  
Kansas City

Minneapolis  
Philadelphia  
Pittsburgh

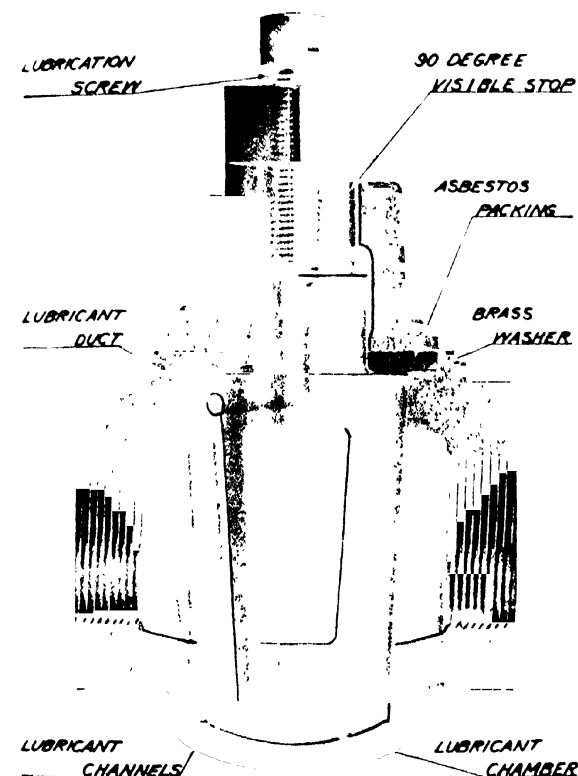
Saginaw  
St. Louis  
And other cities

## PRODUCT

The Merco Nordstrom Plug Valve.

## DESCRIPTION

The general construction and characteristics of the Merco Nordstrom Plug Valve will be evident from a study of the accompanying illustration.



CROSS SECTIONAL VIEW MERCO NORDSTROM PLUG VALVE

The basic principle of the Merco Nordstrom patent is the combination in a plug valve of lubricant conduits and a lubricant chamber at the base of the plug so positioned that when pressure is applied to the lubricant screw, this pressure is transmitted to the chamber at the base of the plug and operates to lift the plug from its seat and simultaneously to distribute lubricant over the bearing surfaces. A flexible packing is provided between the cover and the shoulder of the body and plug of the valve. This packing furnishes the necessary elasticity to allow the plug to be forced from its seat for the purposes of lubrication and to force the plug back into its seat when the pressure in the lubricant chamber is released.

A visible stop is cast as an integral part of the plug and cover and is so positioned that the lubricant channels can never be exposed to the fluid passing through the valve. This stop assures that the valve is fully open or closed and makes it impossible for the operator to become confused regarding the position of the valve.

From the principle of construction it is evident that no matter how firmly the plug may be stuck to the valve, when force is applied to the lubricating screw, enough pressure can be created in the grease chamber to raise this plug from its seat, to separate the metal to metal contact and cause the plug to be free operating.

Merco Nordstrom Plug Valves are so designed that the opening in the plug is equal to the nominal area of each individual pipe size, in other words, a full "100% opening." Furthermore, we also use a solid parallel opening through the plug to minimize friction and to increase the life of the valve. We are sure that both these points will appeal particularly to engineers using valves.

Owing to the lubrication employed, the Merco Nordstrom Plug Valve operates very easily even in the larger sizes. The 6" and 8" valves, for instance, are readily operated with a 30" wrench, and the 12" size turns freely with a 48" wrench.

Since wear and corrosion are reduced to a minimum by the protective coating of lubricant on the bearing surfaces, the Merco Nordstrom Plug Valve will remain tight even under the most severe conditions of service. A very small amount of lubricant is needed for the proper operation of the valve. In ordinary service, for valves which are operated four to six times daily, one cartridge of lubricant per month is sufficient to keep the valve in perfect condition.

Lubricant is supplied in convenient stick form that fits loosely into the shank of the plug when the lubricant screw is removed. Four grades of lubricant are carried in stock as follows:

- No 1 Intended for use with general solutions at 100°F
- No 2 Intended for use with steam (boiler blow-off) and general high temperatures up to 750°F
- No 3 Intended for use with organic solvents, oils, gasoline, coal tar products, etc
- No 4 Intended for use with fluids strongly chemically reactive, as oleum, caustic, chlorine, etc., at temperatures up to 300°F

All of the above lubricants contain special high grade lubricating graphite. For food work and in special cases the lubricants are furnished without the graphite. Information is especially requested from customers regarding service intended so proper lubricant can be sent with the valve.

Merco Nordstrom Plug Valves will be found particularly adapted for use upon hard services demanding exacting conditions as are met in general industries. In the oil refinery upon loading racks, pipe lines, stills, retorts, chemical solutions, light oils, etc. In handling or manufacture of general chemicals as acids, caustic, alkali, bleach, crystallizing salts, corrosive gases, etc. In the power house as throttle valve, boiler blow-off cock, soot blower, oil burner regulator, vacuum or pressure operating either on oil, gas or solution. Wherever a valve is needed that has long life and positive action, where scale, grit or suspended solids are handled freely, and that **Won't Stick and Won't Leak**, the Merco will answer every requirement.

# METAL FABRICS COMPANY

Manufacturers of

Wire Fencing and Wire Belting

MAIN OFFICE

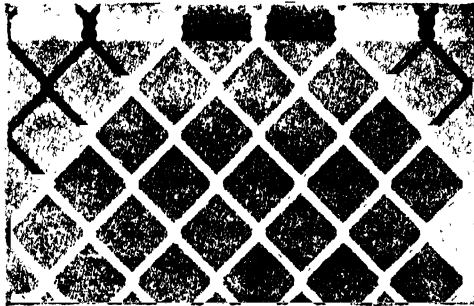
FACTORY  
Keyport, N. J.

34 CLIFF STREET, NEW YORK, N. Y.

## PRODUCTS

Wire Fabric Fencing for industrial plants.  
Wire Belting.

## FENCING



LINKED WIRE FABRIC

The necessity of a sturdy life-long fence surrounding the plant or factory is recognized everywhere. Wire fencing as compared to wood fencing is safe, has a neat appearance and long life. It is free from fire risk, as there is no accumulation of refuse along the base of the fence; a watchman at the fence-gate is all that is needed to prevent intrusion from outsiders.

We manufacture many useful designs that are at the same time artistic and will meet every requirement of a specification.

### LINKED WIRE FABRIC FENCE

This fencing has the strength to withstand any unusual strains or stresses. It will stand the expansion and contraction due to the weather.

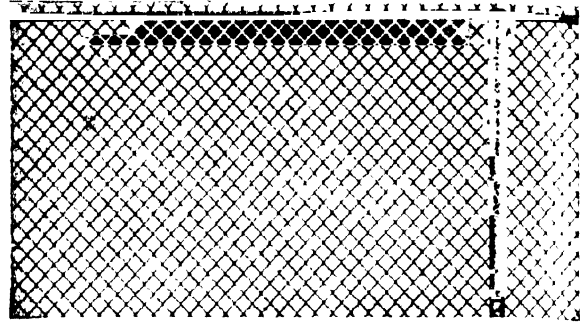
We buy our wire for manufacturing fences in such large quantities that uniformity of the wire throughout is assured.



LIGHT WEIGHT WIRE FENCING

### LIGHT WEIGHT WIRE FENCING

This class of fencing is used wherever a protection is necessary for grass plots, or athletic fields in connection with the welfare department of large industrial plants.



TUBULAR STEEL CONSTRUCTED FABRIC FENCING

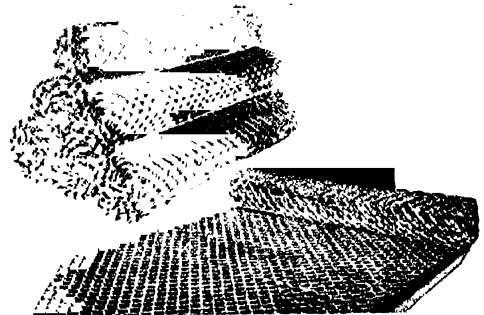
### TUBULAR STEEL CONSTRUCTED FABRIC FENCING

This reinforced sturdy fencing is built by us for situations where the fence runs close to outside stock bins, and work yards, such as steel mills, iron foundries, machine shops, steel plate fabricating shops, etc. Bulk materials falling or resting against this fencing will not stretch it out of shape as it has great resistance.

The illustration below shows our Tubular Steel Constructed Fabric Fencing with the extension arms and barbed wire for added protection against fence climbing. This style is in large demand for manufacturing plant enclosures.



TUBULAR STEEL CONSTRUCTED FABRIC FENCING WITH BARBED WIRE PROTECTION



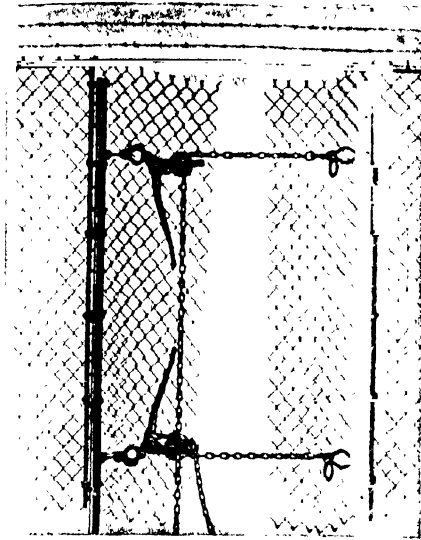
ROLL OF FENCING READY FOR SHIPMENT

### SHIPMENTS OF CHAIN LINK FENCING

Our method of shipping fencing is illustrated above. The rolls are compact and of uniform length. Each

*Continued on Next Page*

can be easily attached to the end of another roll by means of spare wires shaped to the weave of the fence. These wires are supplied with the rolls.



METHOD OF TIGHTENING OUR FENCES

#### INSTALLATION OF OUR FENCING

While we give buyers of our products full instructions how to erect the fencing, we suggest that we send our own workmen to install the fence. This is done with the idea that the best fence when poorly installed, shortens its life a great deal. If too tight it will bulge at some point, and if too loose it will sag and get out of alignment. Our method of installing the fencing is shown here.

#### FLEXIBLE BELTING

We specialize in flexible belting for various purposes and would be pleased to have conveying problems submitted to us for solution.

The advantages of flexible belting are as follows:

It possesses sufficient strength to act as a drive belt as well as a conveying belt.

It may be made in any width without a break.

It can be made in any length without lacing or other joint.

A piece of any size may be taken out or inserted at any point without in any way affecting the character of the belt.

It can be made in any mesh, from the fineness of a lady's mesh bag to as coarse as may be desired.

It may be made from any size wire from the finest up to  $\frac{3}{8}$ " rod if required.

It may be made of any kind of metal necessary to resist the action of various materials.

It may be used on any size of pulley as its flexibility conforms to the surface and still gives sufficient traction.

It is very much cheaper than any other belt of similar utility.

It may be used for drums containing pins or other irregularities.

Its openings permit the free passage of steam, hot air, water or other substances, which are necessary in some classes of manufacture.

Repairs can be made at trifling cost by inexperienced workmen. As this consists simply of replacing defec-

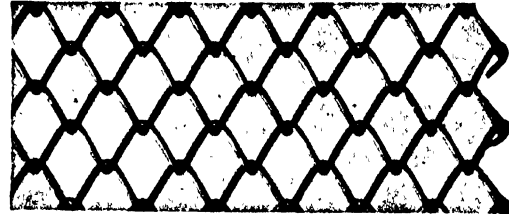
tive wires with new wires, the belt is made exactly like new. These repair wires can be kept on hand at slight expense.

Promptness of delivery could be assured as the same machine could make a wide variety of meshes.

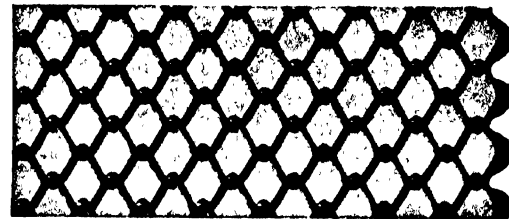
May be used for conveying and screening simultaneously.

We illustrate a few of the innumerable types of belting which we manufacture.

Detailed information will be sent upon request.



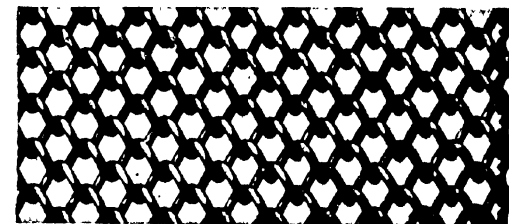
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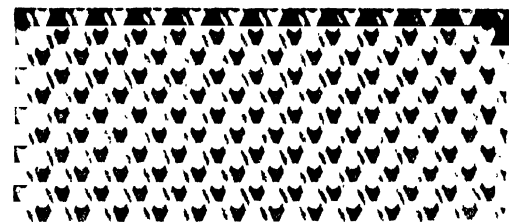
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NO. 618



NO. 518



NO. 616

#### FULL SIZE ILLUSTRATIONS FLEXIBLE WIRE BELTING

NOTE: The coarsest mesh shown above is three openings to the inch. We can furnish any larger mesh, however, up to six-inch opening and any gauge wire required.

# THE MICHIGAN PIPE COMPANY

Combination Steel and Wood Pipe,  
Creosoted Wood Conduits, Steam Pipe Casing

BAY CITY, MICH.

## BRANCH OFFICES

Chicago, Insurance Exchange Bldg  
Boston, 63 Broad St.  
New York, 30 E. 42nd St.

Cleveland, 919 Union Bldg  
Oklahoma City, 14 S. Dwyer St.  
Philadelphia, 318 Widener Bldg

Chattanooga, 792 James Bldg  
Montreal, 294 St. James St.

## PRODUCTS

"Michigan" Combination Steel and Wood Pipe  
"Michigan" Steam Pipe Casings  
Creosoted Wood Conduits.

## USES

"Michigan" Pipe in its various forms is used extensively for

Acids and Gases in Chemical Plants  
Acidulous and Sulphurous Water  
Hot Slops in Distilleries  
Liquors in Tanneries  
White Water and Pulp in Paper Mills  
Water and Culin in Mines  
Heavy Fluids containing Grit, etc.  
Ventilating lines and stacks for Gas and Acid Fumes  
Hydro-Electric Plants

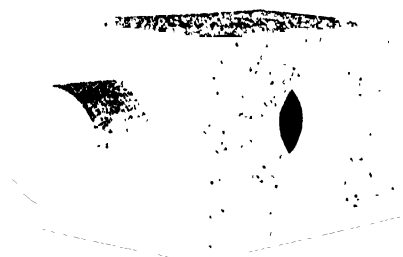
Conveying water, in connection with municipal supply and distribution systems, mines and railroads, flumes, irrigation projects, gravity and pressure feed water lines for mills and factories; for return water in connection with heating plants.



SECTION OF "MICHIGAN" ACID PIPE SHOWING BANDING AND COATING

## ADVANTAGES

Less expensive than iron and steel pipe.  
More durable for chemical use.  
Less expensive to install.  
Greater carrying capacity than metal pipes.  
Non-freezing.  
Not affected by electrolysis.  
Easily tapped for connections.  
Nothing but wood in contact with liquid conveyed.



ACIDPROOF WOOD ELBOWS AND TEES



THE ALL WOOD JOINT

## SERVICE

Skilled engineers furnished to lay out lines, furnish estimates and install "Michigan" pipe.

## SHIPMENT

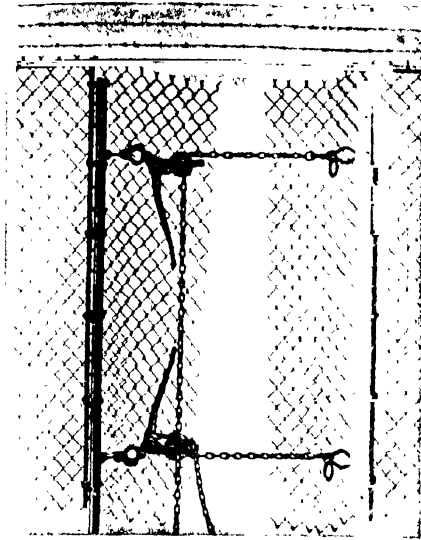
Our facilities enable us to make immediate shipment from stock.



"MICHIGAN" ACID FUME TOWERS

Jarecki Chemical Company Plant, Cincinnati, Ohio

can be easily attached to the end of another roll by means of spare wires shaped to the weave of the fence. These wires are supplied with the rolls.



METHOD OF TIGHTENING OUR FENCES

#### INSTALLATION OF OUR FENCING

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It may be made from any size wire from the finest up to  $\frac{3}{8}$ " rod if required.

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It is very much cheaper than any other belt of similar utility.

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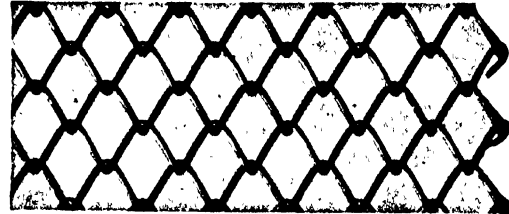
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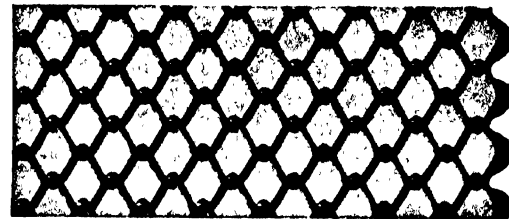
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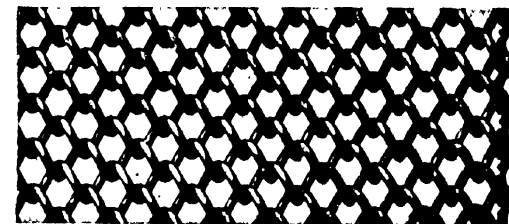
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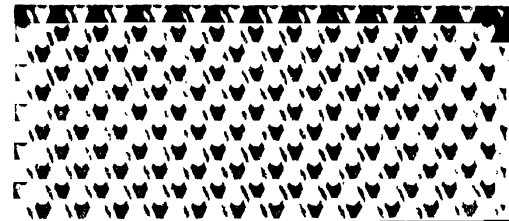
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NO. 618



NO. 518



NO. 616

#### FULL SIZE ILLUSTRATIONS FLEXIBLE WIRE BELTING

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# THE MINE & SMELTER SUPPLY CO.

Ore Dressing and Milling Machinery; Mining Machinery and Supplies  
Machinery, Apparatus, Scientific Instruments, Chemicals,  
Electrical Goods, General Supplies and Equipment

DENVER

SALT LAKE CITY

EL PASO

42 BROADWAY, NEW YORK, N. Y.

Large Supply Depots at Denver, Salt Lake City and El Paso

## PRODUCTS

Sole manufacturers of the Wilfley Concentrating Table, Marcy Ball Mill and Marcy Roller Mill.

Sole selling agents for Dourte Valveless Pumps, Sackett Sand Pumps, Heusser Balances, Samson Laboratory Crushers, Ruth Laboratory Flotation Machines, Colorado Clay Goods and Furnaces, McCool Pulverizers.

## BULLETINS

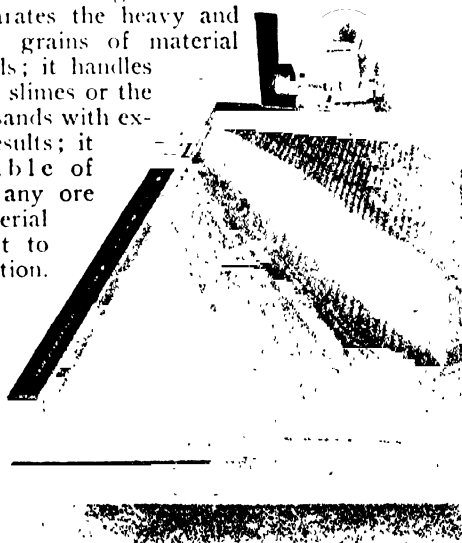
Complete bulletins published for each of our principal products listed here, in addition to large general catalogs of Mill Supplies, Electrical Goods, and Assayer's and Laboratory Equipment and Supplies.

## THE WILFLEY TABLE FOR CONCENTRATION

More than 20,000 Wilfley Concentrating Tables in use in the largest plants all over the world testify to the enormous success and deserved popularity of this table.

The table is a mechanically operated end-wise reciprocating table consisting of a self-oiling enclosed type of head motion, a deck having a plain surface partly riffled and partly unriffled and an under-structure and tilting device.

It separates the heavy and the light grains of material into bands; it handles the finest slimes or the coarsest sands with excellent results; it is capable of dressing any ore or material subject to concentration.



A WILFLEY IN ACTION

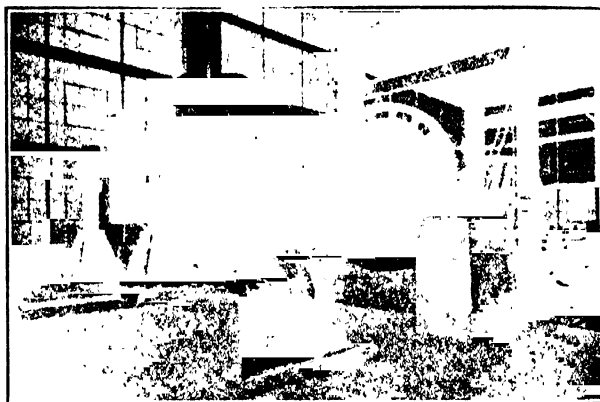
The head motion has a differential movement which gives the greatest travel to the material with the least amount of external agitation. The light, rigid deck, moving in a perfectly horizontal line, is provided with riffles adjusted so that the gangue or waste material will be eliminated all along the table from end to end. The discharge end has sufficient riffle capacity to hold and discharge all concentrates and yet eliminate the gangue.

Bulletin No. 64 fully describes the various types of Wilfley Tables.

## MARCY ROLLER MILLS

The Marcy Roller Mill will take a 1" crusher feed and in one pass of the mill will produce a very uniform product of 8, 10, 14 or 20 mesh which is so essential for good table extraction. This machine is especially desirable for regrinding work.

Experiments were started with the Marcy Roller Mill in January, 1917, and the work has been carried on continually to date. The purpose of the experiments was to develop a rod mill of the highest efficiency having as its paramount feature the minimum cost of crushing.



MARCY ROLLER MILL ON TEST FLOOR

To get the best grinding results from rods it is well recognized that we must have:

1. A heavy, slowly revolving rod mass.
2. A low pulp line or a small amount of pulp in the mill.
3. A practical way to remove broken rods worn as small as  $\frac{5}{8}$ ".

The Marcy Roller Mill is made to meet these operating conditions. It is built along good engineering lines and particular attention has been given to the strength and the wearing qualities of the material used. It has an open end feature, by means of which a low pulp line is maintained and through which the rods can be removed and any new ones replaced with ease. It is so designed that rods stay in the mill.

Descriptive bulletin of Marcy Roller Mills upon request.

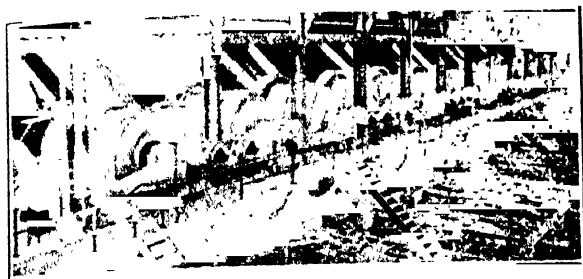
## THE MARCY BALL MILL

The Marcy Ball Mill, which will take a  $2\frac{1}{2}$ " feed, is a wet crushing ball mill having almost the entire discharge end fitted with grates. Between the grate and the end of the mill there are arranged lifters which act as a pump to lift the product so it will be discharged

*Continued on Next Page*



through the discharge trunnion of the mill. The water feed enters the mill through the feed trunnion, consequently there is a difference in elevation between feed as it enters the mill and the point of discharge through the grate. The water, therefore, causes a cleansing action which quickly carries the fines and



**LARGEST BALL MILLING PLANT IN THE WORLD**  
The mills are Marcy Ball Mills

slimes through the grate, then to the lifters and out through the trunnion or discharge end of the mill. This method of operation relieves the mill of a bulky mass of pulp and causes the fines to migrate faster than the coarse particles. It also increases the relative weight of the balls that would otherwise be under the influence of the buoyant effect of the pulp.

**APPROXIMATE MARCY BALL MILL CAPACITIES**

Size Mill	Tons 24 Hrs -8 Mesh	Tons 24 Hrs -20 Mesh	Tons 24 Hrs -35 Mesh	Tons 24 Hrs -48 Mesh	Tons 24 Hrs -65 Mesh	Tons 24 Hrs -100 Mesh
No. 12	20	15	12	10	7	4
No. 14	50	38	30	25	18	11
No. 16	60	45	35	28	20	12
No. 18	90	68	52	40	28	16
No. 20	300	225	180	150	105	60
No. 24	655	490	390	325	230	130
No. 36	1000	750	600	500	360	200

The product of the Marcy Mill is nearly non-selective. By non-selective is meant a product in which the mineral has not been subject to a classifying action, nor has it become over-crushed as compared with the gangue. Whereas, in the operation of all classes of overflow trunnion discharge mills, there is a vertical gravity classification of the mineral from the gangue. That is, the mineral being heavier, is carried lower or next to the periphery and consequently ground up into undesirable product.

For more complete information write for Bulletin No. 62.

**HEUSSER BALANCES**

The most perfect and the most complete Precision Balances produced by the Instrument Maker's Art.

Manufactured exclusively for The Mine & Smelter Supply Company.

These highly-successful balances have been used and recommended during the past fifteen years by Assayers, Chemists and Scientific Research Workers the world over. They have been recognized as instruments of superior qualities possessing many valuable, unique and distinguishing features which are briefly described below.

**All Metal Balance Casing**—Combining elegance of appearance with great mechanical strength; is absolutely proof against all climatic conditions, magnetic disturbances and electrical influences. It

admits an unusually large amount of light and except through violent accidents it is practically indestructible.

**Unit Base and Releasing Mechanism**—Forms a compact unit of all the working parts. This construction maintains the perfect alignment and adjustments of all parts during transportation and in service.

**Beams Are of the Trussed Form**—Combining maximum of rigidity with minimum of weight. All beams are direct reading and are warranted to maintain their adjustment under all climatic conditions.

**Multiple Weight Attachment**—For the purpose of mechanically manipulating the weights by means of a keyboard located in front of the Balance. Free from annoying complications and possibilities for making errors. The most perfect device for this purpose and a great time-saver. Capacity of weights for assay balances 221 or 121 milligrams. For Analytical Balances 2210 milligrams.

**Mechanical Pan Extractor**—For the purpose of conveying objects from the outside of the balance casing into the weighing pan of the balance, or vice versa, without opening the balance door. Prevents dust and air currents from penetrating into the interior of the balance and is a great time-saver.

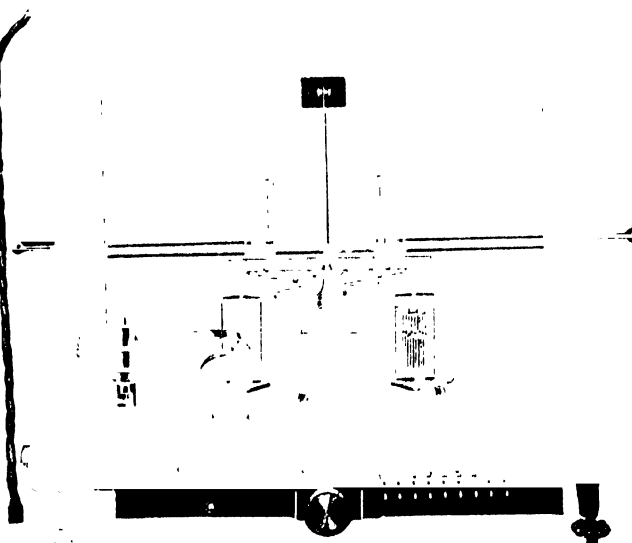
**Electric Balance Illuminator**—Enables the balance to be set up anywhere, even in a dark room, to perform the weighing at any time, day or night, and to obtain better results than with daylight.

**Balance Cover**—Is permanently attached to the balance casing. It is always there, always handy, never misplaced. Made of best quality artificial leather.

*Four groups of Assay Balances with sensitivities ranging from 1/100 to 1/500 milligrams, or twenty different styles.*

*Three groups of Analytical Balances with sensitivities ranging from 10 to 1/100 milligrams, or fifteen different styles.*

*Write for Complete Catalog.*



**HEUSSER ASSAY BALANCE, WITH MULTIPLE WEIGHT ATTACHMENT, PAN EXTRACTOR AND ILLUMINATOR**

# MONARCH MFG. WORKS, INC.

Westmoreland and Salmon Streets

PHILADELPHIA, PA.

## PRODUCTS

Spray Nozzles, Airwashing Nozzles, Syphons, Lead Valves, Acid Lifts, Strainers.

## ACID CHAMBER SPRAYS

Individually tested to give perfect, even atomization without streaks or drops.

The nozzle (tip and disc) is made entirely of stoneware. Holder is made of lead. Acid proof and non-erosive, will not break or crack from temperature changes. Used by most sulphuric acid manufacturers. Fully guaranteed. Sent on sixty days' approval to any sulphuric acid plant in the U. S.

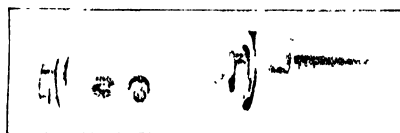


FIG. 604 STONWARE CHAMBER SPRAY

The illustration shows threaded type nozzle, which will fit existing lead socket using nozzles with soft lead inside parts.

Flanged, Fig. 602, Chamber Spray (not shown) except in installation opposite requires no wrench to tighten, and is often preferred to Fig. 604.



FIG. 602-604 INSTALLATION

## CAPACITIES, GALLONS PER HOUR

Orifice M. M.	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Lbs. pressure									
30		2.7	3	3.3	4	5.4	10.1		
40	2.5	3.1	3.2	3.8	4.5	9	11.5		
60	3.2	3.7	4.1	4.6	5.1	11	14		
80	3.6	4	4.6	5.1	5.7	12	15		
90	3.8	4.3	4.9	5.6	6.2	12.8	16		

Larger capacities than above, up to about 200 gph. at 60 lbs. produced with Fig. 602 and 604 A Stoneware nozzles, No. 2 size.

## ATOMIZING SPRAYS, BRASS

This type of spray nozzle screws directly onto pipe.

They are made up regularly from Brass, Iron, Steel, Monel Metal, Hard Rubber, etc., in sizes 1/4 to 1", capacities covering some of which are listed below.

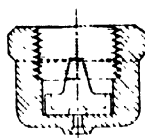


FIG. 610 NOZZLE

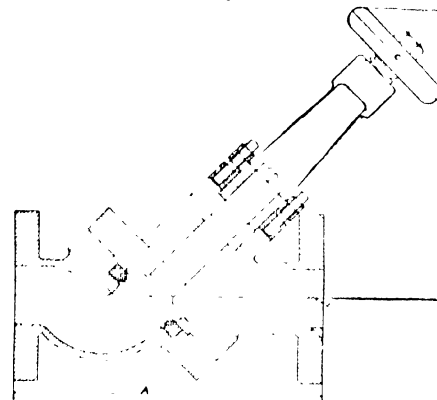
## CAPACITIES, GALLONS PER HOUR

Orifice M. M.	1/4" pipe							3/4" pipe			
	1/4	1/2	3/4	1	1 1/4	1 1/2	2	2 1/4	3	3 1/4	
Lbs. pressure											
30			2.7	3.0	3.3	5.1	7.3	5	23	36	
40	1.0	2.5	3.1	3.2	3.8	5.7	7.9	10	31	42	
60	1.3	3.2	3.7	4.1	4.6	8.6	9.6	15	22	38	56
80	1.8	3.6	4	4.6	5.1	8.8	10.5	20	25	43	60
								25	28	48	65
								30	33	51	72
								60	50	70	105

For 1/2", 3/4" and 1" pipe sizes write for capacities which will be furnished

## HARD LEAD STOP VALVE

The seat of this valve, when worn, may be renewed and renewed from time to time. Spindle may be seated. Spindle does not turn on seat, therefore no wear. Angle form of valve produced with same lead.



## DIMENSIONS

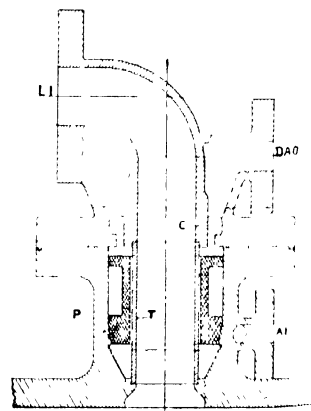
	1	1 1/2	2	2 1/2	3	4
A	7 1/8	7 1/8	10 7/8	11 7/8	12 3/8	14
B	8 1/2	8 1/2	10 1/2	13	13 1/2	15
C	3 3/4	3 3/4	4 1/4	6 1/8		

## AUTOMATIC ACID LIFT

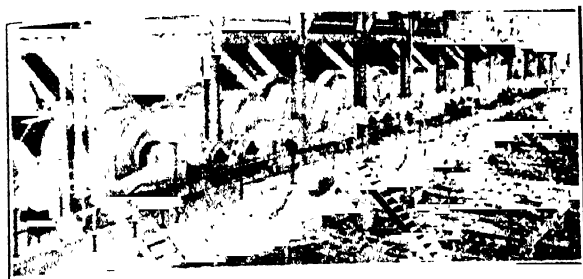
This device can be quickly connected to any blowcase (egg), and will automatically blow acid to any desired height, depending on air pressure.

Operation—Acid flows from the usual low level tank through a check valve and through the "Monarch" Air Device into egg. When filling, the displaced air in egg escapes through passage between tube T and plug P into annular air chamber C and through discharge air outlet DAO. High pressure air enters at A1. When egg becomes filled acid flows up under plug P, and the combined action of air and liquid unseats plug, thus releasing high pressure air through several ports on taper seat, which forces plug P up and seating at top closes exhaust air port. Air then forces check valve shut and acid out the usual discharge pipe. Instantly egg and discharge pipe are cleared of acid there is a sudden rush of air out, dropping the pressure within the egg, thus allowing plug P to drop and close high pressure air ports and at the same time opening the exhaust port. The head of liquid in filling tank opens check and starts recharging.

Operation is continuous and automatic, and therefore saves air, men and money.



through the discharge trunnion of the mill. The water feed enters the mill through the feed trunnion, consequently there is a difference in elevation between feed as it enters the mill and the point of discharge through the grate. The water, therefore, causes a cleansing action which quickly carries the fines and



**LARGEST BALL MILLING PLANT IN THE WORLD**  
The mills are Marcy Ball Mills

slimes through the grate, then to the lifters and out through the trunnion or discharge end of the mill. This method of operation relieves the mill of a bulky mass of pulp and causes the fines to migrate faster than the coarse particles. It also increases the relative weight of the balls that would otherwise be under the influence of the buoyant effect of the pulp.

**APPROXIMATE MARCY BALL MILL CAPACITIES**

Size Mill	Tons 24 Hrs -8 Mesh	Tons 24 Hrs -20 Mesh	Tons 24 Hrs -35 Mesh	Tons 24 Hrs -48 Mesh	Tons 24 Hrs -65 Mesh	Tons 24 Hrs -100 Mesh
No. 12	20	15	12	10	7	4
No. 14	50	38	30	25	18	11
No. 16	60	48	38	30	22	13
No. 18	90	72	58	45	32	18
No. 20	300	225	180	150	105	60
No. 24	655	490	390	325	230	130
No. 36	1000	750	600	500	360	200

The product of the Marcy Mill is nearly non-selective. By non-selective is meant a product in which the mineral has not been subject to a classifying action, nor has it become over-crushed as compared with the gangue. Whereas, in the operation of all classes of overflow trunnion discharge mills, there is a vertical gravity classification of the mineral from the gangue. That is, the mineral being heavier, is carried lower or next to the periphery and consequently ground up into undesirable product.

For more complete information write for Bulletin No. 62.

**HEUSSER BALANCES**

The most perfect and the most complete Precision Balances produced by the Instrument Maker's Art.

Manufactured exclusively for The Mine & Smelter Supply Company.

These highly-successful balances have been used and recommended during the past fifteen years by Assayers, Chemists and Scientific Research Workers the world over. They have been recognized as instruments of superior qualities possessing many valuable, unique and distinguishing features which are briefly described below.

**All Metal Balance Casing**—Combining elegance of appearance with great mechanical strength; is absolutely proof against all climatic conditions, magnetic disturbances and electrical influences. It

admits an unusually large amount of light and except through violent accidents it is practically indestructible.

**Unit Base and Releasing Mechanism**—Forms a compact unit of all the working parts. This construction maintains the perfect alignment and adjustments of all parts during transportation and in service.

**Beams Are of the Trussed Form**—Combining maximum of rigidity with minimum of weight. All beams are direct reading and are warranted to maintain their adjustment under all climatic conditions.

**Multiple Weight Attachment**—For the purpose of mechanically manipulating the weights by means of a keyboard located in front of the Balance. Free from annoying complications and possibilities for making errors. The most perfect device for this purpose and a great time-saver. Capacity of weights for assay balances 221 or 121 milligrams. For Analytical Balances 2210 milligrams.

**Mechanical Pan Extractor**—For the purpose of conveying objects from the outside of the balance casing into the weighing pan of the balance, or vice versa, without opening the balance door. Prevents dust and air currents from penetrating into the interior of the balance and is a great time-saver.

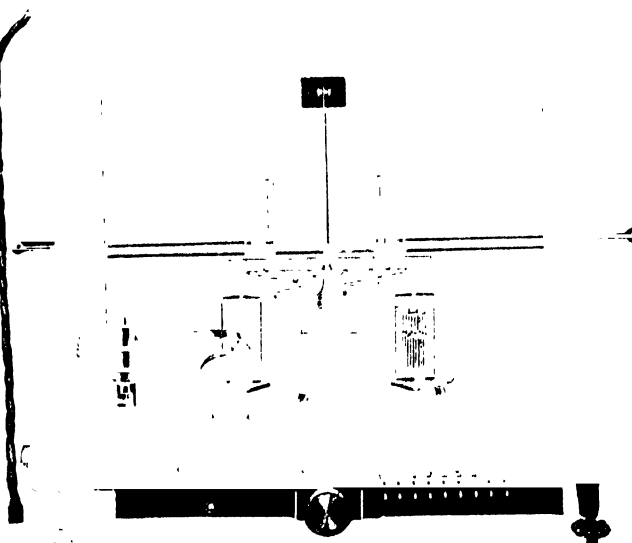
**Electric Balance Illuminator**—Enables the balance to be set up anywhere, even in a dark room, to perform the weighing at any time, day or night, and to obtain better results than with daylight.

**Balance Cover**—Is permanently attached to the balance casing. It is always there, always handy, never misplaced. Made of best quality artificial leather.

*Four groups of Assay Balances with sensitivities ranging from 1/100 to 1/500 milligrams, or twenty different styles.*

*Three groups of Analytical Balances with sensitivities ranging from 10 to 1/100 milligrams, or fifteen different styles.*

*Write for Complete Catalog.*



**HEUSSER ASSAY BALANCE, WITH MULTIPLE WEIGHT ATTACHMENT, PAN EXTRACTOR AND ILLUMINATOR**

# LUCAS E. MOORE STAVE CO., INC.

## Hogsheads, Barrels, Casks and Kegs

### NEW ORLEANS, LA.

#### EASTERN OFFICE

#### 11 Broadway, NEW YORK, N. Y.

#### FACTORIES

#### NEW ORLEANS, LA.

#### MOBILE, ALA.

#### COLUMBUS, MISS.

#### LEXINGTON, KY.

### PRODUCTS

Wooden Containers for holding Liquid, Semi-Liquid, and Solid Chemical and Technical Products.

Barrels

Casks

Hogsheads

Kegs

Tubs

### MATERIALS

We use the best grade of White Oak, Red Oak, Gum and Ash woods exclusively, and carry large stocks of these woods at all times.

### WORKMANSHIP

Containers for holding valuable liquids or semi-liquids require not only the highest grade of material, but above all, the greatest attention to perfection in workmanship. Subjected as these containers are, to the roughest usage in shipment, they must be constructed in the strongest manner, and both the wooden parts and the metal hoops must be fitted with the greatest accuracy. We have perfect facilities in our various factories for assuring this high grade of perfection.

### USES

Tight cooperage, such as we manufacture, is especially suited for use as containers for such substances as require, on account of their liquid nature, or their composition, to be enclosed in a package that will not only prevent leakage, but will, when necessary, prevent the deteriorating influence of exposure to air or moist atmospheres.

### REPRESENTATIVE SUBSTANCES USUALLY SHIPPED IN TIGHT BARRELS

Alcohols

Beverages

Bleaching compounds

Chemicals

Cider

Dyes and colors

Electro-plating solutions

Extracts

Fats

Food products

Glues

Greases

Paint, varnish and colors

Polishes

Sugars, sirups and molasses

Vinegar

Of over 7,000 items of commercial chemical substances listed in the Condensed Chemical Dictionary, over 1,000 are best shipped in tight wooden barrels or kegs.

### KEGS, BARRELS AND HOGSHEADS

We can furnish large quantities of standard sizes of kegs, barrels and hogsheads, made of white oak, for containing liquids or semi-liquids of any nature.

### SHOOKS

We are prepared to furnish quantities of shooks for export.



STANDARD WHITE OAK BARREL

# MOREHEAD MANUFACTURING COMPANY

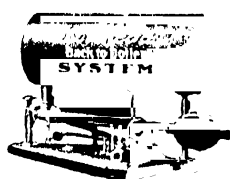
## Steam Drainage and Boiler Feeding Apparatus

(Known as the Morehead Back-to-Boiler System)

DETROIT, MICHIGAN

### PRODUCTS

Tilting Steam Traps, Return, Variable Pressure, Non-Return, Vacuum and Condenser Types, for Draining High or Low Pressure and Vacuum Heating System of Water of Condensation, and Making any Desired Disposition of the Condensation. There is a "Morehead" Steam Trap to Meet Every Condition Arising in a Steam Plant.



"MOREHEAD" RETURN STEAM TRAP

The Return Steam Trap removes water of condensation from heating, drying and cooking apparatus and returns the condensation direct to the boilers regardless of any difference in pressure on the apparatus drained and the boiler or whether the apparatus is located above or below the water line. It is admirably adapted for use as a lift pump, and for feeding boilers from open or closed heaters. It handles perfectly, water at any temperature.

### RETURN STEAM TRAP

The Return Steam Trap removes water of condensation from heating, drying and cooking apparatus and returns the condensation direct to the boilers regardless of any difference in pressure on the apparatus drained and the boiler or whether the

apparatus is located above or below the water line. It is admirably adapted for use as a lift pump, and for feeding boilers from open or closed heaters. It handles perfectly, water at any temperature.

### NON-RETURN TRAP

This type of Morehead Steam Trap is especially adapted to the removal of condensation from high or low pressure steam mains, dryers, heaters, etc., and delivering the water to an open tank, hot well or feed water heater. This trap has a removable seat and disc in the valve. It discharges from low point, insuring an effective water seal at all times. It is guaranteed for 200 lbs. working pressure.

MOREHEAD NON-RETURN STEAM TRAP

It is guaranteed for 200 lbs. working pressure.

### VARIABLE PRESSURE TRAP

Recommended for receiving and discharging to any desired point condensation from steam lines and apparatus working under varying pressures.

### VACUUM TRAP

The Vacuum Trap removes automatically all condensation from exhaust lines and oil separators operating under a vacuum without breaking or impairing that vacuum. It delivers the water of condensation to any desired point above or below the location of the trap and is guaranteed not to affect the vacuum in any way.



MOREHEAD VACUUM TRAP

### CONDENSER TRAP

The Condenser Trap is a combination of the features of a Morehead Automatic Return Trap and the Jet or Spray Condenser. It is especially adapted to service on exhaust steam and reduced pressure heating, cooking and drying apparatus. The positive vacuum formed in the tank of the trap removes rapidly all condensation in the system, accelerates the travel of the steam and reduces the back pressure on the engine.

SIZES, CAPACITY AND WEIGHTS MOREHEAD TILTING VARIABLE PRESSURE AND NON-RETURN STEAM TRAPS

Variable Pressure Trap	1	2	3	4	5	6	7	8
Capacity, Gals. Per Hr.	100	100	100	100	100	100	100	100
Capacity, Gals. Per Hr.	100	100	100	100	100	100	100	100
Capacity, Gals. Per Hr.	100	100	100	100	100	100	100	100
Capacity, Gals. Per Hr.	100	100	100	100	100	100	100	100
Capacity, Gals. Per Hr.	100	100	100	100	100	100	100	100
Capacity, Gals. Per Hr.	100	100	100	100	100	100	100	100
Capacity, Gals. Per Hr.	100	100	100	100	100	100	100	100
Capacity, Gals. Per Hr.	100	100	100	100	100	100	100	100

### MOREHEAD TILTING RETURN, VACUUM, AND CONDENSER STEAM TRAPS

Vacuum Trap	Condenser Trap	Return Trap	Capacity, Gals. Per Hr.	Capacity, Gals. Per Hr.	Capacity, Gals. Per Hr.	Capacity, Gals. Per Hr.	Capacity, Gals. Per Hr.	Capacity, Gals. Per Hr.
41	42	43	44	45	46	47	48	49
100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100

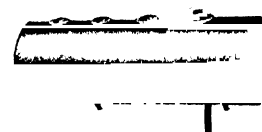
The above capacities are figured on a basis of 50 pounds pressure to the square inch. The above drainage capacity in inch pipe is based on ordinary radiating conditions. For lumber kilns, greenhouses and moist goods, divide by two. For laundries, brick dryers and wet goods, divide by three. For fan stacks and blowers, divide by five.

Capacities of steam traps vary greatly, according to conditions under which they are operated.

Note: 3 feet of 1 inch pipe equals one square foot of surface. 23 feet of 1 1/4 inch pipe equals one square foot of surface. 161 feet of 2 inch pipe equals one square foot of surface.

### MOREHEAD RECEIVERS

No.	Length, Inches	Height, Inches	Diameter, Inches
1	30	16	10
2	40	20	12



MOREHEAD RECEIVER

No. 1 Receiver has capacity for Traps Nos. 1 and 2. No. 2 Receiver has capacity for Traps Nos. 3, 4, 5 and 6.

To compute the equivalent in 1 inch pipe of any quantity of pipe of larger diameter, use the following table of equations:

Size of Pipe	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8
Equivalent of 1 Lineal ft. in 1"	1.26	1.41	1.81	2.19	2.66	3.04	3.42	3.80	4.23	5.03	5.80

Special Note—Quotations on copper or brass tanks with bronze, brass, nickel, steel or cast iron fittings will be made on request.

# MORGAN CONSTRUCTION COMPANY

Gas Producer Department  
WORCESTER, MASS.

Cable Address MORG

## PRODUCT

Morgan Producer-Gas Machine.

## DESCRIPTION

The Morgan Producer-Gas Machine has established a **continuous record of satisfactory service** during the past seven years unapproached by any other type of mechanical Gas Producer. This service is attained by painstaking care in both design and manufacture and is based on the principle that continuous surface leveling of a gas-making fire gives results far superior to poking, both as to gas quality and ease of operation.

## OPERATION

A measuring feeder delivers coal of any size up to four-inch cubes, direct from the overhead bin on to the fuel bed at frequent intervals, without action on the part of the operator, whose work is confined to regulating the speed to correspond with the demand for gas. The coal is properly spread and the surface continuously leveled by the lever which floats on the fuel, and permits any practicable variation in height of surface.

Ash is removed mechanically at one point into a conveyor by a spiral-shaped plow, held stationary during one complete revolution of the ash-pan, and then released automatically.

The development of a closed feeder, operating without manual action, together with the other improvements noted, makes it possible for one man to attend to the gasification of nine tons of coal per hour.

## OPERATING RESULTS, GAS QUALITY

In one plant of a leading steel company four units were installed to do the work usually requiring six mechanical producers. During a period of four months three machines produced all the gas, working at an average rate of over 30 tons coal per day. Continuous twelve-hour samples of the gas were taken day and night for several weeks with the following results:

### AVERAGE ANALYSIS OF 12-HOUR CONTINUOUS GAS SAMPLES

Date	CO <sub>2</sub>	C <sub>2</sub> H <sub>4</sub>	CO	H <sub>2</sub>	CH <sub>4</sub>	B. T. U. of Gas	
						U. S. Steel Formula	Total at 32° Fahr.
Feb. 2-7, 1914	2.8	0.6	27.4	11.4	3.6	162.0	182.5
Feb. 9-14, 1914	2.8	0.6	27.3	11.1	3.4	159.0	179.0

## QUANTITY OF COAL GASIFIED IN CONTINUOUS OPERATION

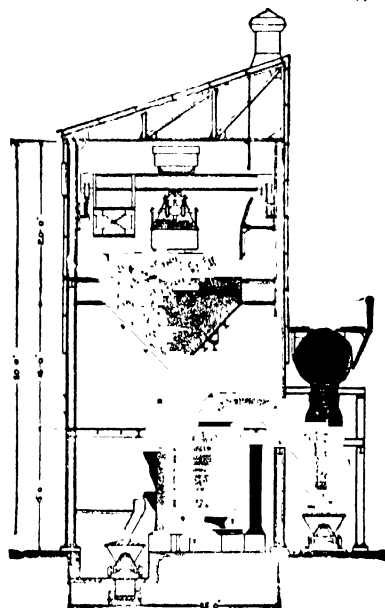
Date		Average Pounds Coal per Hour	Average B. T. U. of Gas	
			U. S. Steel Formula	Total at 32° F.
Feb. 9, 1914	Day	2800	158.5	178.5
	Night	2740	149.0	168.0
Feb. 10, 1914	Day	2740	162.5	183.0
	Night	2600	154.0	173.0
Feb. 11, 1914	Day	2740	168.0	189.0
	Night	2600	151.5	170.5
Feb. 12, 1914	Day	2800	166.0	187.0
	Night	2800	148.0	166.0
Feb. 13, 1914	Day	2800	165.5	186.0
	Night	2800	160.0	180.0
Average		2760	158.5	178.0

Another customer, operating open-hearth furnaces, analyzed an eight-hour continuous sample of the gas practically every day. The average for five months was 3.5 per cent CO<sub>2</sub>, 28.8 CO, and 182 B. T. U.

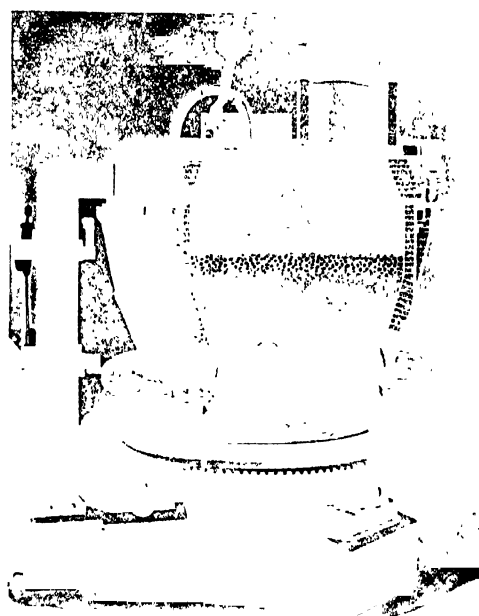
Further experimenting gave them the following gasifying capacities and disclosed the fact that the quality of gas does not suffer at these high working rates.

## GASIFYING CAPACITY OF PRODUCER-GAS MACHINE

Date	Net Tons Coal per Day	Operating Hours per Day	Pounds Coal per Hour	B. T. U. of Gas	
				U. S. Steel Formula	Total at 32° F.
September 21-22	32.35	23.70	2730	167.0	188.0
September 22-23	30.00	23.05	3190	168.5	190.0
September 23-24	34.15	22.05	3100	165.0	186.0
September 24-25	37.34	22.90	3260	165.5	186.5



INSTALLATION MORGAN GAS PRODUCER



SECTION OF PRODUCER GAS MACHINE  
Feeder not shown

Catalog and List of over 400 Installations sent on request.

# MORRIS MACHINE WORKS

ESTABLISHED 1864

BALDWINSVILLE, NEW YORK

New York, N. Y. 39 41 Cortlandt St.  
 Philadelphia, Pa. Harris Pump & Supply Co.  
 Texas H. A. Paine  
 St. Louis, Mo. Cameron & Barkley Co.  
 St. Louis, Mo. Morkle Machinery Co.  
 St. Louis, Mo. Vickers & Co.  
 New York, N. Y. Root Seal Co.  
 St. Louis, Mo. Power Plant Supply Co.

Tampa, Fla. Cameron &amp; Barkley Co.

Philadelphia, Pa. Real Estate Trust Building  
 Chicago, Ill. Henton & Hubbell 217 221 N.  
 Jefferson St.  
 Charlotte, N. C. Realty Building  
 San Francisco, Cal. Harrison, Rickard & McCone  
 Boston, Mass. Stackweather & Broadhurst  
 Denver, Colo. H. W. Moore & Co.  
 Salt Lake City, Utah F. C. Richmond Ma-  
 chinery Co.  
 Portland, Ore. Gordon & Finkbeiner

## PRODUCTS

Centrifugal Pumping Machinery, Hydraulic  
 Dredges, Stationary and Marine Engines.

## EXPERIENCE

During the 57 years devoted to this line of work our  
 experience has covered all services for which centrif-  
 ugal pumps are used. We are the oldest and largest  
 firm in the country building exclusively this type.

## HORIZONTALLY SPLIT SINGLE AND MULTI- STAGE PUMPS

This type of Pump meets the demand for an efficient  
 pump capable of operating at high speeds for direct  
 connection to electric motor or steam turbine. Where



4-INCH HORIZONTALLY SPLIT SINGLE STAGE PUMP

the head is high it is built in stages. The suction and  
 discharge opening are cast in the bottom half so that  
 the pump can be taken apart without disturbing the  
 pipe lines. The enclosed impellers are of bronze, ac-  
 curately finished and balanced for high speeds. The



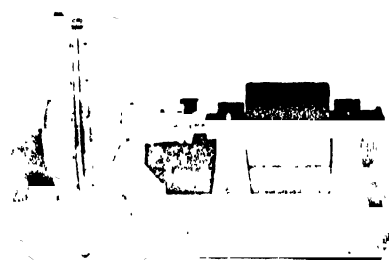
6-INCH 2-STAGE HORIZONTALLY SPLIT MULTI-STAGE PUMP

shaft is of steel, protected by bronze sleeves through  
 the stuffing boxes. These pumps are equipped with  
 outboard ring oiling bearings with removable bab-  
 bitted sleeves. The multi-stage pumps have a water  
 cooled marine type thrust bearing running in oil. The  
 single stage pump is of the double suction type and  
 whatever slight thrust develops is compensated by S.  
 K. F. ball bearings. Leakage between stages is pre-  
 vented by labyrinth impeller rings, which also main-  
 tain the efficiency of the pump.

These pumps are made of an acid-resisting metal  
 when operating in liquids containing sulphuric or  
 other chemicals which would readily eat out the stand-  
 ard iron pump.

## STANDARD HORIZONTAL PUMPS

This pump is the type most extensively used for  
 general work, and is especially adapted for low lifts.

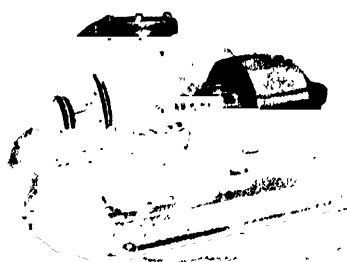


STANDARD HORIZONTAL PUMP

There is a substantial babitted bearing on each side  
 of the pulley, which can be furnished of the ring oiling  
 type if desired. The shaft is of large diameter, made  
 of turned steel. The stuffing box is deep and arranged  
 with gland. Sizes 1" to 12" inclusive are carried in  
 stock.

## SOLID LINED DREDGING PUMPS

This pump was originally designed for handling  
 slimes in connection with gold recovery plants. The  
 lining, which is practically an independent pump, is



SOLID LINED DREDGING PUMP

made either of Manganese Steel, Hard Cast Iron or  
 Acid Resisting Bronze as desired. The impeller is of  
 the enclosed type and of the same material as the liner.  
 The bearings have removable babitted sleeves. For  
 handling gritty water, coal, ashes, sand, gravel, etc.,  
 this pump is unexcelled. It is built in sizes from two  
 to twelve inches, some of which are carried in stock.

**OVER 65,000 PUMPS IN SERVICE**

# MORSE CHAIN COMPANY

## Largest Manufacturers of Silent Chains in the World

### ITHACA, N. Y.

#### ADDRESS NEAREST BRANCH OFFICE

Atlanta, Ga. 702 Candler Building  
 Baltimore, Md. 1102 Lexington Building  
 Boston, Mass. 141 Milk Street  
 Charlotte, N. C. 404 Commercial Bank Building  
 Chicago, Ill. Merchants L. & T. Building  
 Cleveland, Ohio Engineers' Building  
 Detroit, Mich. 5th and Abbott Sts.  
 Kansas City, Mo. Morse Engineering Co. Finance Building  
 Minneapolis, Minn. Strong-Scott Mfg. Co. Third Street S.

New York 50 Church Street  
 Philadelphia, Pa. 808 Harrison Building  
 Pittsburgh Westinghouse Building  
 St. Louis, Mo. Morse Engineering Co., Chemical Building  
 San Francisco, Cal. Monadnock Building  
 Canada Jones & Glasco, Registered  
 Montreal St. Nicholas Building  
 Toronto Traders Bank Building

#### PRODUCT

Morse Silent Chains and Sprockets for the transmission of power for every purpose. The use of special alloy steels with heat treatment and improved machinery in the largest silent chain factory in the world, combine to make the most durable and only 99% efficient drive on the market.

#### GENERAL DESCRIPTION

The Morse Rucker Joint Silent Chain Drive is essentially a steel belt, made of flat links arranged to form teeth on one side of the chain which engage with teeth cut in the sprocket wheels over which it runs.

It is a gear belt and used in place of belting and gearing and made in varying pitches from  $\frac{3}{8}$  in. to 3 ins. to transmit from  $\frac{1}{4}$  H. P. to 5,000 H. P.

In use to-day for over 3,000,000 H. P., giving positive speed ratios, increased production, short centers, better light, less maintenance, freedom from overhead construction.

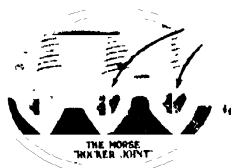


25 H. P. MORSE SILENT CHAIN DRIVING POSITIVE BLOWER IN A WESTERN SMELTING PLANT

#### THE MORSE ROCKER JOINT

The principal difference between "Morse" and all others is in that unseen but all-important part, the joint. Morse Drives are constructed with the fact in view—the joint bears the burden. Instead of a single pin, as in other joints, two special pins, both held in their respective halves, form the joint. No bushing is required.

When the chain is running straight, between sprockets, the flat of seat pin bears against one of the flat faces of rocker pin. As the chain bends in circling each sprocket, the curved side of one pin rolls or rocks against the broad, flat side of the other, entirely eliminating destructive grinding friction.



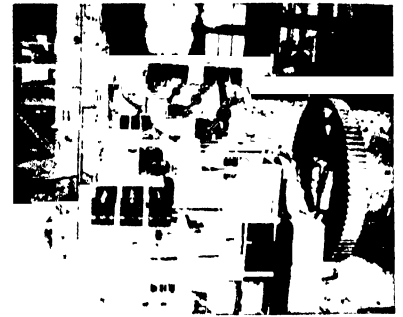
THE MORSE ROCKER JOINT

#### SPEED AND SERVICE

This exclusive "Rocker Joint" construction enables the Morse to run at a speed far in excess of other chains because lubricant is not essential to its operation; and after years of service (in every line of industry) it is accepted as the most durable chain on the market.

#### MATERIAL PARTS

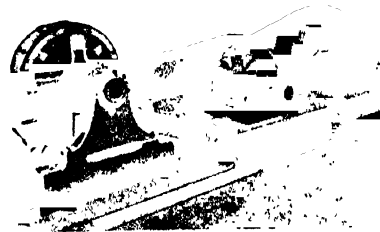
"Morse Drives" have great mechanical strength and are made with a large factor of safety, assuring 100 per cent overloads. They need little attention, and consist of driving and driven sprockets (solid or split, s.s., and keyed) and silent chain belt. Driven sprockets are usually of cast iron. Driving sprockets of cast iron or steel as service requires.



100 H. P. MORSE SILENT CHAINS DRIVING 5' x 20' TUBE MILLS  
 Six in sight, more on another floor

#### ADVANTAGES

Morse is accepted as the drive that is: positive as gears, flexible as a belt; unaffected by heat, cold, moisture or oil; durable, and gives long life and is especially desirable for service in Chemical and Metallurgical Works where dust, gases, acid fumes and steam ruin leather belting.



80 H. P. DRIVE SHEET LEAD ROLLS  
 Reverses drive every 45 seconds

The world-wide demand and use in the most severe duty of Chemical Works, Smelters, Mines, and Mills is the evidence of their success.

#### MORSE ENGINEERING SERVICE

Send us your general layout and let our Sales Engineers design the drive to suit your special requirements. Engineering service and designs free. Address nearest office. Free bulletins for every industry.



# MORRIS MACHINE WORKS

ESTABLISHED 1864

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 St. Louis, Mo. Cameron & Barkley Co.  
 St. Louis, Mo. Morkle Machinery Co.  
 St. Louis, Mo. Vickers & Co.  
 New York, N. Y. Root Seal Co.  
 St. Louis, Mo. Power Plant Supply Co.

Tampa, Fla. Cameron &amp; Barkley Co.

Philadelphia, Pa. Real Estate Trust Building  
 Chicago, Ill. Henton & Hubbell 217 221 N.  
 Jefferson St.  
 Charlotte, N. C. Realty Building  
 San Francisco, Cal. Harrison, Rickard & McCone  
 Boston, Mass. Stackweather & Broadhurst  
 Denver, Colo. H. W. Moore & Co.  
 Salt Lake City, Utah F. C. Richmond Ma-  
 chinery Co.  
 Portland, Ore. Gordon & Finkbeiner

## PRODUCTS

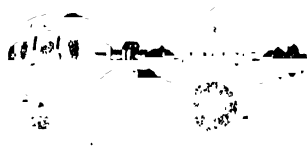
Centrifugal Pumping Machinery, Hydraulic  
 Dredges, Stationary and Marine Engines.

## EXPERIENCE

During the 57 years devoted to this line of work our  
 experience has covered all services for which centrif-  
 ugal pumps are used. We are the oldest and largest  
 firm in the country building exclusively this type.

## HORIZONTALLY SPLIT SINGLE AND MULTI- STAGE PUMPS

This type of Pump meets the demand for an efficient  
 pump capable of operating at high speeds for direct  
 connection to electric motor or steam turbine. Where



4-INCH HORIZONTALLY SPLIT SINGLE STAGE PUMP

the head is high it is built in stages. The suction and  
 discharge opening are cast in the bottom half so that  
 the pump can be taken apart without disturbing the  
 pipe lines. The enclosed impellers are of bronze, ac-  
 curately finished and balanced for high speeds. The



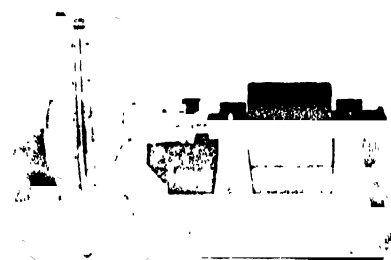
6-INCH 2-STAGE HORIZONTALLY SPLIT MULTI-STAGE PUMP

shaft is of steel, protected by bronze sleeves through  
 the stuffing boxes. These pumps are equipped with  
 outboard ring oiling bearings with removable bab-  
 bitted sleeves. The multi-stage pumps have a water  
 cooled marine type thrust bearing running in oil. The  
 single stage pump is of the double suction type and  
 whatever slight thrust develops is compensated by S.  
 K. F. ball bearings. Leakage between stages is pre-  
 vented by labyrinth impeller rings, which also main-  
 tain the efficiency of the pump.

These pumps are made of an acid-resisting metal  
 when operating in liquids containing sulphuric or  
 other chemicals which would readily eat out the stand-  
 ard iron pump.

## STANDARD HORIZONTAL PUMPS

This pump is the type most extensively used for  
 general work, and is especially adapted for low lifts.

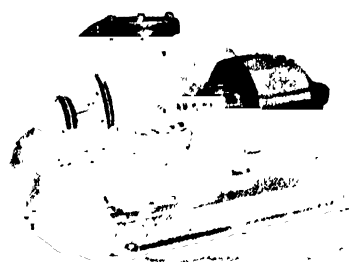


STANDARD HORIZONTAL PUMP

There is a substantial babitted bearing on each side  
 of the pulley, which can be furnished of the ring oiling  
 type if desired. The shaft is of large diameter, made  
 of turned steel. The stuffing box is deep and arranged  
 with gland. Sizes 1" to 12" inclusive are carried in  
 stock.

## SOLID LINED DREDGING PUMPS

This pump was originally designed for handling  
 slimes in connection with gold recovery plants. The  
 lining, which is practically an independent pump, is



SOLID LINED DREDGING PUMP

made either of Manganese Steel, Hard Cast Iron or  
 Acid Resisting Bronze as desired. The impeller is of  
 the enclosed type and of the same material as the liner.  
 The bearings have removable babitted sleeves. For  
 handling gritty water, coal, ashes, sand, gravel, etc.,  
 this pump is unexcelled. It is built in sizes from two  
 to twelve inches, some of which are carried in stock.

**OVER 65,000 PUMPS IN SERVICE**

# MULTI METAL COMPANY, Inc.

257 West 19th Street

NEW YORK, N. Y.

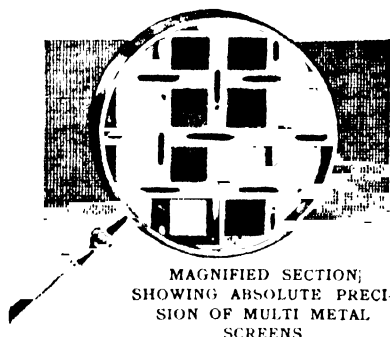
## PRODUCTS:

Wire Cloth in all meshes and all metals, for Sifting, Bolting, Straining and Filtration. Metallic Filter Cloth, acid and alkali resistant; Standard Laboratory Testing Sieves up to 300 mesh; Special Sieves for Manufacturing Purposes; Swiss Silk Bolting Cloth; Perforated Metals.

## WIRE CLOTH:

Wire Cloth of precision and great durability, especially adapted to the exacting requirements of the Chemical Industry. Made in all meshes from

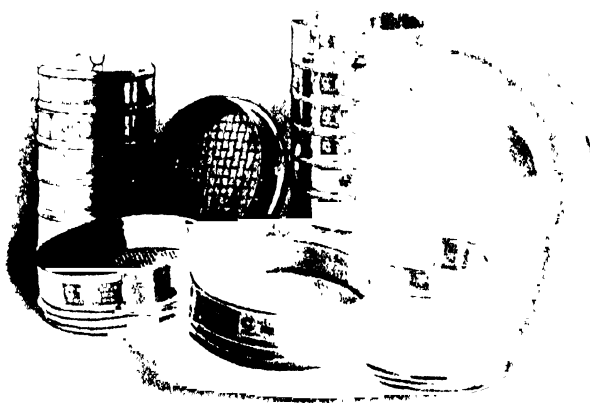
No. 1 mesh up to No. 300 mesh in all metals, such as Aluminum, Brass, Bronze, Copper, German Silver, Iron, Monel Metal, Nickel, Silver, Steel, also Lead and Tin-coated Steel Screens.



MAGNIFIED SECTION;  
SHOWING ABSOLUTE PRECISION OF MULTI METAL  
SCREENS

## STANDARD TESTING SIEVES:

Sieves from No. 1 mesh to No. 300 mesh carried in stock in 6", 8" and 12" diameter. Made according to specifications of Bureau of Standards.



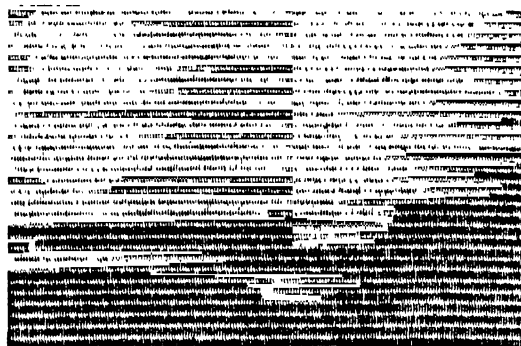
TESTING SIEVES

## SIEVES FOR MANUFACTURING PURPOSES:

For sifting small batches of chemicals, colors, dyes, etc., which would not warrant the installation of sifting machinery, we supply special manufacturing sieves, made in any size or shape and in a variety of metals and meshes.

## MONEL METAL FILTER CLOTH:

An all-metal filter cloth, acid and alkali resistant for filtration of chemical solutions, sugar juices, etc. Carried in stock at all times. Filter Leaves of any size promptly covered.



MONEL METAL FILTER CLOTH No. 300

## FABRICATING DEPARTMENT:

In this department we fabricate our wire cloth into Sieves of every kind, Strainers, Dipping Baskets, etc. We also cover Filter Leaves of every type. Quick service and unsurpassed workmanship.



FILTER LEAVES

## SPECIAL SERVICE DEPARTMENT:

When confronted by problems involving the sifting, bolting or filtering of materials, we suggest that you avail yourself of our services as screening specialists. This service is free.

## SILK BOLTING CLOTH:

Swiss Silk Bolting Cloth and Grit Gauze, from 18 mesh to 200 mesh, carried in stock in 40" width. Cloths made up to fit any bolting machine.

## PERFORATED METALS:

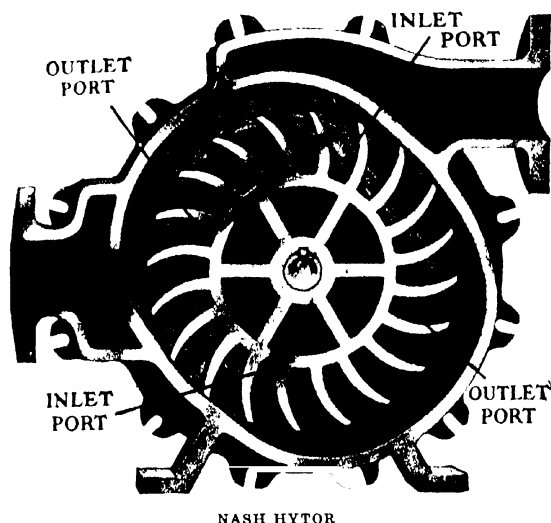
We specialize in perforated screens of the unusual kind, such as Aluminum, Monel Metal, Nickel; also Brass, Copper, etc.

# THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONN., U. S. A.

## PRODUCTS

Vacuum Pumps; Acid Pumps (Gas); Compressors; Vacuum Heating Pumps; Boiler Feed Pumps; Centrifugal Pumps.



## NASH HYTOR

The pumps here described have been built for over eight years by the Nash Engineering Company and have been sold extensively under the name Hydroturbine. The new name Hytor has now been adopted.

Principle of operation is shown in the sectional drawing.

A rotor in hydraulic balance revolves freely with large clearances, in an elliptical casing filled with water. The water, turning with the rotor, and constrained to follow the casing by centrifugal force, alternating recedes from and is forced back into the rotor, twice in a revolution. As the water recedes from the rotor it draws in air through the inlet ports. When the water is forced back into the rotor by the converging casing, the air is first compressed and then discharged through the outlet ports.

To absorb the heat of compression a small continuous supply of water is introduced at the pump inlet. This water, with any additional liquid drawn in with the air, is discharged through the outlet ports with the air.

The quantity of water required for operation is usually  $\frac{1}{2}$  to 2 gals. per 100 cu. ft. of air, depending on the water temperature and the pressure and dryness of the air required.

While water ordinarily is used as the displacing liquid, because of the fact that it is usually available and because of the higher efficiency due to its low viscosity and relatively great weight, any other liquid may be employed provided it does not form scale or attack the interior of the pump and provided it is not too viscous.

## DRY AIR

The air is freed entirely of entrained moisture by a special separator supplied with each compressor. This separator is equipped with a ball float valve, which automatically allows the water to escape without loss of air.

The air is delivered saturated at approximately the temperature of the water issuing from the separator.

The Hytor compressor and vacuum pump is valveless, has no gears, loose moving or reciprocating parts, no piston packing to renew, no cylinders to lubricate and no bearing adjustments to make.

## CLEAN AIR

The air is thoroughly washed during compression and contains no oil. In many instances the Nash Hytor compressor can be used to do the work of an air washer, an air cooler, and a compressor.

This washing feature is a great advantage in the agitation of food products or in agitation or absorption processes where the diffusion of air or gas is accomplished by blowing through filter plates, porous blankets or small orifices.

## ACID GAS

Nash Hytor compressors are successfully handling various gases, both acid and alkaline, either with special arrangement for various liquid seals or in special constructions.

## MATERIALS

Standard Hytor compressors are constructed of cast iron, but special machines are supplied with bronze lining and of solid bronze.

## PRESSURES

The Nash Hytor is recommended for pressures up to and including 15 lbs. per sq. in. and for vacuums not in excess of 20" of mercury.

Capacities Standard Pressure			Capacities Standard Vacuum Pumps		
Size	Speed	Cu. ft. free air per min. against 10 lbs. pressure	Size	Speed	Cu. ft. per min. at vac. 12" mercury
$\frac{1}{2}$ 0	1600	30	$\frac{1}{2}$ 0	1350	25
0	1600	50	0	1350	40
1	1000	90	1	950	90
2	750	200	2	650	180
3	600	340	3	500	300
4	500	450	4	445	440
6	360	935	6	310	600
7	300	1400	7	260	1350
8	250	2250	8	200	2150

Patterns for larger sizes carried in stock

## PUBLICATIONS

Bulletin Number	Subject
15	Jennings Hytor Vacuum Heating Pumps
16	Hytor Air Line Heating Pumps
10	Nash Hytor Compressors
11	Nash Hytor Vacuum Pumps
17	Jennings Hytor Condensation Return Pumps
18	Jennings Hytor Turbine Driven Heating Pumps
19	Jennings Hytor Suction Centrifugal Pumps

# NASSAU VALVE & PUMP CORPORATION

Manufacturer of "Chemetal" Acid Resisting Valves, Pumps, Etc.

ROCKVILLE CENTRE, N. Y.

## PRODUCTS

"Chemetal" Valves, Pumps, Strainers, and Castings for corrosive liquids. Special valves made to order.

### "CHEMETAL" VALVES

Especially designed for acid service in the Chemical and Allied Industries, "Chemetal" Valves are made of a high grade antimonial lead for a standard pressure of 150 lbs. and can be supplied in all standard sizes in the following patterns: Globe, Angle, Gate, Cross, "Y," Check, and Diaphragm. The stem, which is of the rising type, is made of bronze and covered with "Chemetal," so that all parts of the valve coming in contact with the liquid are protected by this acid-proof alloy.

Valve bodies are heavily reinforced by ribs to pre-

vent breakage or warping of flanges. Special valves may be ordered made of Aluminum, Brass or specified alloy. Valves may also be supplied with acid proof rubber discs or rubber plugs, for handling of liquids that are carrying a large amount of gritty material in suspension.

### "CHEMETAL" PUMPS

"Chemetal" Centrifugal Pumps are suitable for pumping a wide variety of acids and chemical solutions and are used extensively in chemical plants.

The casing is built of a special lead alloy reinforced by heavy ribs. Pumps have large center suction and discharge opening may be turned in any direction to suit pipe connections.

The impeller is of the enclosed type, made of "Chemetal" with bronze core; all surfaces hand finished to reduce friction losses; impeller and shaft carefully balanced to insure smooth running. Impeller and casing fitted with suitable labyrinth rings to prevent leakage of liquid from discharge to suction.

Stuffing boxes are made extra long and can be furnished with waterseal and drip gland.

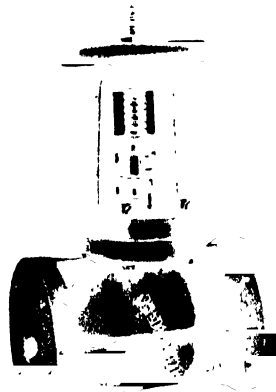
Shaft of high grade steel and large diameter; one end screwed into the bronze core and protected by heavy "Chemetal" sleeve; the other end held rigidly by two outside bearings of the ring oiling type with thrust collar and wiper.

Bed plate and stands of cast iron, and fitted for belt drive or direct connection to motor or turbine. Flexible couplings furnished for all motor driven pumps; suitable tight and loose pulleys for belt drive.

**Data Required for Estimates**—1. What is the liquid to be pumped? Give temperature and specific gravity. 2. Capacity of pump in gallons per minute. 3. Total lift, including suction, discharge, pipe friction in feet. 4. Motive power, whether belt drive or direct connected motor. 5. Pump discharge to be right or left hand.



VERTICAL CHECK VALVE

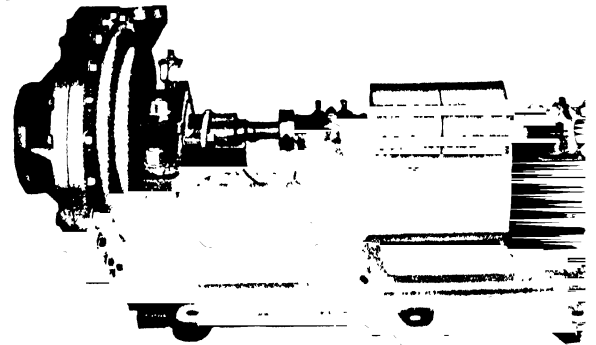


"CHEMETAL" GLOBE VALVE



"CHEMETAL" GATE VALVE "CHEMETAL" "Y" VALVE  
DIMENSIONS "CHEMETAL" VALVES

Size of Valve	1"	1½"	2"	2½"	3"	4"	6"
Face to Face (Globe, Diaphragm, Gate, and Horizontal Check)	5½	6	7	7½	8	9	10½
"Y" Valve—Face to Face	7	7½	8½	9	9½	10½	15
Center to Face (Angle Stop and Angle Check)	2½	3¼	3¾	4¾	4¾	5½	7¾
Diameter of Flange	1	5	6	7	7½	9	11
Diameter of Bolt Circle	1	3¾	4¾	5½	6	7½	9½
Vertical Check Valve	¾"	1"	1½"	2"	2½"	3"	
Face to Face	1½	2	2½	2½	2½	2½	
Diameter of Flange	4	5	6	6¾	7½	8	
Diameter of Bolt Circle	3	3¾	4¾	5½	6	6½	



"CHEMETAL" PUMP, BELT DRIVEN

Number of Pump	1"	1½"	2"	3"	4"
Suction	1½	2	3	4	5
Discharge	1	1½	2	3	4
Normal Capacity G. P. M.	25	70	100	250	450

### "CHEMETAL" CASTINGS

"Chemetal" castings of any description are made to order and properly machined and finished in accordance with customers' drawings and specifications.

# NATIONAL AIROIL BURNER COMPANY

Ninth and Thompson Streets

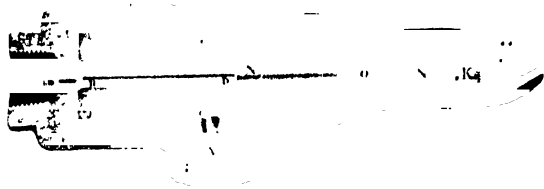
PHILADELPHIA, PA.

## PRODUCTS

Oil Burners and Oil Burning Equipment.

## GENERAL DESCRIPTION

The National Oil Burner is of the internal steam atomizing type—an inside mixer—but differs in every feature of its construction for any other burner of its class. It is a result of scientific study of the principles of combustion and steam engineering. The oil is so thoroughly prepared inside the burner that every atom of the heaviest fuel oil is consumed without ever clogging the burner or forming any accumulation of carbon inside the furnace.



INTERIOR DETAILS OF NATIONAL OIL BURNER

Oil under low pressure enters the burner at (A) and passes into a chamber (C), which entirely surrounds the steam nozzle (BD). After the first few minutes of operation the entire burner is at steam temperature, about 250° F. or higher, and the oil while in the chamber (C) is raised to about that temperature.

The steam nozzle (BD) extends into and discharges the steam into a forward nozzle (NON). The oil passes from chamber (C) in an annular film into the same nozzle (NON). This nozzle (NON) forms a venturi tube with its throat at (O). The relation of the two nozzles (BD) and (NON) is so calculated that the angle of expansion of the steam leaving nozzle (BD) causes the steam to cut its way through and mix with the oil at (O). The oil and steam so mixed then pass to the front chamber (K) where they are churned into an emulsion, while the fan-shaped orifice through which the oil is fed from the chamber (K) into the furnace, is designed to sufficiently retard the discharge of the mixture of oil and steam during the churning process.

## SPECIAL FEATURES

The National Oil Burner has several special features worthy of notice:

There is no needle valve in the burner. The importance of this feature cannot be overestimated. Despite the most careful straining, particles of solid matter and small globules of water will occasionally pass into the system and clog a burner having a needle valve. In the National Oil Burner this globule of water passes into chamber (C) and then into chamber (K) where it is churned up with the oil and steam and its presence has no effect.

Because of the superheating of the oil in chambers (C) and (K) as it is fed into the furnace, it is only necessary to have the oil in the system hot enough to flow freely, about 100° to 120° F.

The National Oil Burner is constructed on the principle of an injector, and when the steam is turned on will feed the oil into the furnace when there is only sufficient pressure on the oil to cause it to flow freely to the burner.

Chamber (K) is so constructed that pressure builds up at the discharge nozzle of the burner and makes possible a great economy in the consumption of steam for atomizing the oil, not more than one and a half to two per cent. of the steam generated being used for this purpose.

We absolutely guarantee that the National Oil Burner will operate continuously without clogging and without the need of cleaning, and that it will consume every atom of the heaviest fuel oil without leaving any unconsumed carbon.

## OPERATION

This burner is exceedingly simple in operation and can be handled without danger by the average attendant about the plant, and in the boiler room, complete instructions for operating are furnished with each burner.

## APPLICATIONS

These burners can be used for many industrial heating purposes, principal among which are:

Firing kilns in the ceramic, brick, tile and refractory industries

Firing furnaces used in the glass industry

Firing kilns for manufacture of chemicals, cements, pigments, etc.

Operation of various types of reverberatory and other furnaces in the metallurgical industries

Heating stills, boilers, digesters and all kinds of direct-fired equipment in the various chemical industries

In addition to the above, these burners are capable of unlimited application in the power generating departments of all kinds of industrial chemical plants.

## CAPACITIES

National Oil Burners are made in three regular sizes

No. 1—Small size, sufficient for 100 h. p. boilers or small heating or melting furnaces

No. 2—Medium size, sufficient for 175 h. p. boilers or medium heating or melting furnaces

No. 3—Large size, sufficient for 275 h. p. boilers or fairly large heating or melting furnaces

All three sizes will do considerably more than stated, but experience tells us that it is economical to operate the burners moderately rather than to force any burner to its limit. However, three No. 3 burners will easily care for 1000 h. p. boilers or large heating or melting furnaces.

# NASSAU VALVE & PUMP CORPORATION

Manufacturer of "Chemetal" Acid Resisting Valves, Pumps, Etc.

ROCKVILLE CENTRE, N. Y.

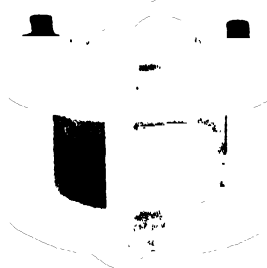
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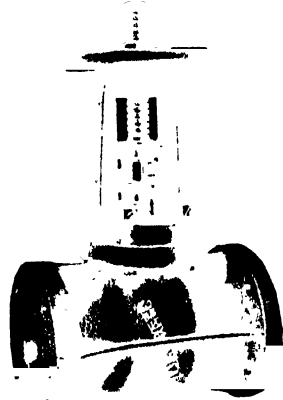
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Valve bodies are heavily reinforced by ribs to pre-



VERTICAL CHECK VALVE



"CHEMETAL" GLOBE VALVE



"CHEMETAL" GATE VALVE "CHEMETAL" "Y" VALVE  
DIMENSIONS "CHEMETAL" VALVES

Size of Valve	1"	1½"	2"	2½"	3"	4"	6"
Face to Face (Globe, Diaphragm, Gate, and Horizontal Check)	5½	6	7	7½	8	9	10½
"Y" Valve—Face to Face	7	7½	8½	9	9½	10½	15
Center to Face (Angle Stop and Angle Check)	2¾	3¼	3¾	4¾	5¼	5¾	7¾
Diameter of Flange	1	5	6	7	7½	9	11
Diameter of Bolt Circle	1	3¾	4¾	5½	6	7½	9½

Vertical Check Valve	¾"	1"	1½"	2"	2½"	3"
Face to Face	1¾	2	2½	2¾	2¾	2½
Diameter of Flange	1	5	6	6¾	7½	8
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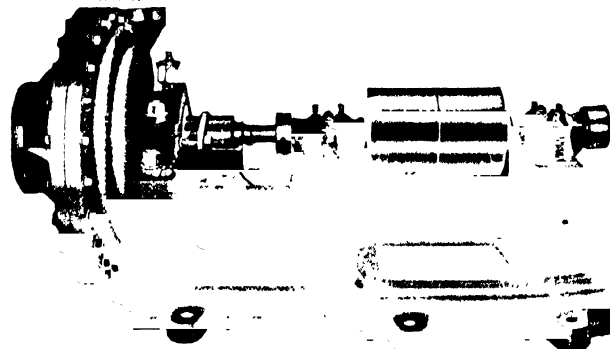
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Shaft of high grade steel and large diameter, one end screwed into the bronze core and protected by heavy "Chemetal" sleeve; the other end held rigidly by two outside bearings of the ring oiling type with thrust collar and wiper.

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Ninth and Thompson Streets

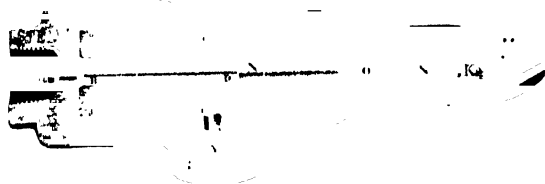
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# NATIONAL FILTER CLOTH & WEAVING CO.

Manufacturers of Filter Cloth Exclusively

56 HOPE STREET, BROOKLYN, N. Y.

CHICAGO OFFICE 536 So. Dearborn Street

## PRODUCTS

Cotton Filter Cloth in a great variety of weaves for filtering any required liquid.

## FACILITIES

In our manufacturing plant located at the above address, we have weaving machines for the production of filter cloth with any mesh you may desire. The filtration problems that daily come to the attention of the process engineer can best be solved by the selection of the proper mesh of cloth. Filter Cloth carried in stock in standard weaves may be satisfactory in many instances, but our business was founded on the knowledge that special weaves are essential to the rapid and thorough clarification of innumerable products. We are specialists in filter cloth and can solve your individual problem as we have a host of others.

If you are having trouble filtering your products, write us now, or better yet, send us a sample of the material and our **Special Service** Department will undoubtedly find that your difficulty has already been overcome by us, in some other similar case.



ONE OF OUR WEAVING MACHINES

## CONSULTATION

We have solved some very unusual problems during the recent years of growth of the chemical industries. The time for filtration has been cut to a fraction of that formerly required for the many new products that were developed. The accumulated data we have at hand from all these problems will aid us in advising you, while we reserve only the confidential matters.

## STANDARD MESH FILTER CLOTHS

Some of our weaves are of standard requirements and we are ready at all times to submit samples and quote prices to firms interested in securing filter cloth direct from the manufacturer.



## SPECIAL FILTER CLOTHS TO ORDER

We manufacture Filter Cloth in width from 26 inches to 72 inches, exclusive.

Weight of goods varies from 12 ounces per square yard to 30 ounces per square yard.

Cloth can be made up to be shipped by the roll, or cut into sheets to fit any type of standard or special press or filter.

## A FEW OF THE PRODUCTS FILTERED THROUGH OUR CLOTHS

Aniline Dyes	Olive Oil
Lakes	Fruit Juices
Mineral Colors and Pigments	Wine
Clay	Sugar Liquors
Whiting	Pharmaceuticals
Varnish	Explosives
Cottonseed Oil	Insecticides
Animal Oils	Paraffine Wax
Fish Oils	Petroleum By-products

## THE RELATION OF PROPER CLOTH TO EFFICIENCY

A slight change in the weave of filter cloth used will often make great changes in the cost of producing a commercial product.

For instance, in the manufacture of dyestuffs special weaves are required for the proper filtration of certain dyes. If the proper weave is not attained there is a consequent loss in the output of the batches. We would suggest, on all present low yields of dyes per batch, that you get in touch with us and make a few runs with various weaves that we make, to ascertain the effect on the yield of your product.

## DELIVERIES

Our manufacturing facilities are such as to enable us to guarantee Uniform Deliveries.

After solving problems for our customers, by finding the weave that gives the most efficient results, we are certain that the problem is solved once for all. By that we mean that our cloth is uniform for every shipment, whether these shipments are one day or six months apart.

## PRICES

We shall be pleased to quote promptly on any quantity of any of our standard or special weaves.



# THE NATIONAL PIPE BENDING COMPANY

Incorporated 1883

Coilers of Pipe and Tubing

164 River Street

NEW HAVEN, CONN.

## BRANCH OFFICES

Boston, Mass.  
Buffalo, N. Y.  
Chicago, Ill.Cleveland, Ohio  
Jacksonville, Fla.  
Charlotte, N. C.Philadelphia, Pa.  
Pittsburgh, Pa.  
Salt Lake City, UtahWashington, D. C.  
New York, N. Y.

## PRODUCTS

Coils and Bends of Iron, Brass and Copper Pipe and Tubing, Refrigerating Coils, etc.

Coil Type Feed Water Heaters, Fuel Oil Heaters, Water Storage Heaters; Instantaneous Hot Water Generators and Forced Circulation Heating System Convertors; Direct Contact Open Type Heaters and Purifiers; Storage Heaters; Steam and Oil Separators, Steam and Feed Water Heaters.

## FACILITIES

All "National" Coils are continuous, without couplings or screwed fittings, unless specified. Iron and Steel Coils have electrically welded joints and all Brass and Copper Tubes have brazed joints. The National Pipe Bending Co. is equipped to fill practically any want in the line of pipe and tube bending. Prepared to submit designs, specifications and estimates covering coils and bends for the particular requirements of plant. The National Pipe Bending Co. is constantly making large numbers of new designs and will quote promptly on receipt of sketches and specifications. Among the types of coil regularly manufactured are

- 1 Square or box coils
- 2 Oblong or trombone coils
- 3 Zigzag coils
  - (a) Plain zigzag coils
  - (b) Collapsed zigzag coils
- 4 Flat spiral coils
  - (a) Plain flat spiral coils, Fig. 218
  - (b) Dished flat spiral coils
  - (c) Multiple deck flat spiral coils, Fig. 216
- 5 Spiral coils:
  - (a) Plain helical coils
  - (b) Tapered helical coils
  - (c) Double nested helical coils, also triple nested, quadruplicate nested, etc. Fig. 60 shows triple nested helical coils

## SPIRAL COIL

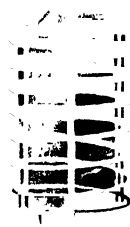
This coil is made with both ends at the top, but the end which is brought up from the bottom may be turned up either inside or outside of the coil.



SPIRAL COIL

## REDUCING COIL

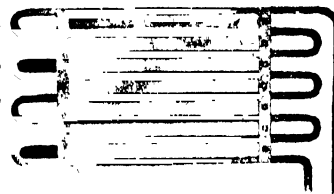
This is a condenser coil for distilling plants. It is made by commencing with a large size of pipe and forming smaller pieces end to end successively until the last piece is what is required to carry the liquid.



REDUCING COIL

## RETURN BEND OR ZIGZAG COIL

Used largely in refrigerating plants, also for heating coils, either by use of steam or hot water.



RETURN BEND OR ZIGZAG COIL

## ROUND FLAT COIL, OPEN

This is made to go in the bottom of a round tank for heating or cooling purposes. Flat coils may be made to suit the shape of either square or oblong tank. It can also be dished if the tank has curved or conical bottom. We also make them carrying up the outside either plain spiral or taper, forming a "Basket Coil," which occupies little room in the tank but gives large heating or cooling surface. The ends may be carried in any direction.

Round Flat Coil also made in "close" type.



ROUND FLAT COIL

## NATIONAL FEED WATER HEATERS

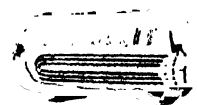
Of Coil type, maintain efficiency under high overloading. The National design secures increased efficiency in heat transmission, insures even distribution of the feed water in the several coils or tubes and permits of easy access to the tube ends.



FEED WATER HEATER

## NATIONAL STORAGE HEATERS

Heat and store large volumes of water for constant or occasional use. Either live or exhaust steam may be used. Readily removable heating element facilitates inspection, repairs or the substitution of larger or smaller elements.



STORAGE HEATER

# NATIONAL TANK & PIPE COMPANY

Manufacturers of Wood Products  
PORTLAND, OREGON



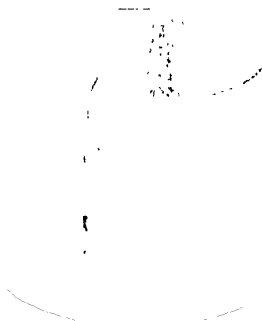
## PRODUCTS

Tanks, including Mining Tanks, Paper Mill Tanks, Acid Tanks, Pulp Tanks, Conical Bottom Tanks, Thickener Tanks, Agitating Tanks, Zinc Boxes, Flo-tation Tanks, Acid Towers, Car Tanks, Water Tanks, Oil Tanks, Railroad Tanks, Rectangular Tanks, Pres-sure Tanks, Silos.

Reduction Plants, Filtration Plants, Cross Arms.

## WOODEN TANKS

Douglas Fir or California Redwood, thoroughly seasoned. Diameters 1' to 100'; height 1' to 50'; thick-ness of material up to 6". Hooping standard round rolled thread mill steel bands. Special hooping either flat or round steel, bronze, etc. Furnished with plain or patent non-shrinking device as desired.



STANDARD ROUND WOOD TANK

## CONICAL BOTTOM TANKS

Conical Bottom Tanks made with any degree bot-tom desired.



CONICAL BOTTOM TANK

## PRESSURE TANKS

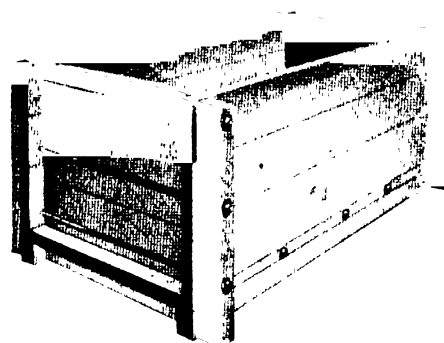
Equipped with steel or wood buck stays.

## OIL TANKS

Plain or patent.

## RECTANGULAR TANKS

Manufactured on special orders. Steel, bronze, lead covered rods. Built especially to meet the needs of  
Chemical Works  
Plating Works  
Tanneries  
Glue Works  
Packing Houses, etc.



STANDARD RECTANGULAR TANK

## DELIVERY

Large and varied stock on hand assures prompt de-livery of any size order.

## SHIPPING FACILITIES

Five Transcontinental Railroads. Water transpor-tation to any port.

## MANUFACTURING FACILITIES

Our factory, covering 12 acres at Portland, Ore., is one of the largest factories in the United States spe-cializing in Tanks, Silos and Cross Arms. Our En-gineering Department is competent to thoroughly solve any tank problems submitted.

## CROSS ARMS

Manufactured to standard or special specifications from kiln dried Douglas Fir. Treated or untreated.

## MILL DEPARTMENT

Specializing in kiln dried finish, flooring, pump rods, ceiling, special timbers, etc. Dimension or finish run to special patterns.

# NEWARK WIRE CLOTH COMPANY

Wire Cloth in all Metals, Filter Cloth, Etc.

224 Verona Avenue  
NEWARK, N. J.

## PRODUCTS

Wire Cloth, All Grades,  
Fine and Extra Fine  
Filter Cloths (Metallic)  
Centrifugal Cloths  
Bolting Cloths  
Testing Sieves, U. S. Standard (Trade Mark)  
Chemists' Sieves  
Cement Sieves  
Foundry Riddles  
Coal and Sand Screens



We make the above products in Brass, Copper, Bronze, Phosphor Bronze, Nickel, Steel, Monel Metal, Silver, Gold and Platinum, and in all meshes and sizes.

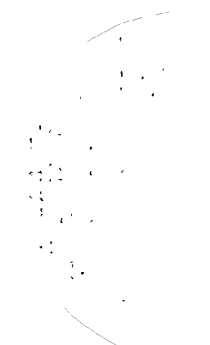
## "NEWARK" METALLIC FILTER CLOTH

We are the originators of this grade of Metallic Filter Cloth; we invite close inspection of our three different grades of this material for filtration work and centrifugal linings.

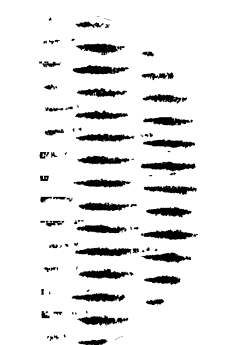
Note the character and even texture of the weave, strength and durability, are imparted to the fabric. It has a double surface, is extra strong, and is readily cleaned.

One section shows the exact size of mesh, while the other section shows the cloth magnified—Note the spiral overlap in the weave. "Newark" Metallic Filter Cloth is for use in all makes of filter presses in place of cotton, duck, wool, jute or other filtering mediums—and will stand strong solutions which shorten life of others.

## WRITE FOR SAMPLES



EXACT SIZE OF MESH



SAME MESH MAGNIFIED

## SERVICE

We suggest that you try the Newark Wire Cloth Company's products and service.

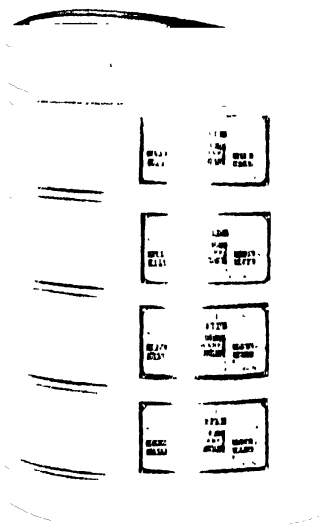
## SAMPLES

We will gladly furnish samples of our Newark Filter Cloth, or other grades as may be required on request.

## NEW U. S. BUREAU OF STANDARDS TESTING SIEVE SCREEN SCALE

This Screen Scale is a departure from any reference to mesh, and is designated by arbitrary numbers. It is essentially metric. A sieve having an opening of 1 mm. is the Basic one, the sieves above or below are related to it by the use of the fourth root of two as the ratio of the width of one opening to the next smaller opening.

This scale has been approved by all scientific bodies.



NEST OF U. S. STANDARD TESTING SIEVES

## U. S. STANDARD SIEVE SERIES

Sieve Number	OPENING		Wire Diameter	
	MM	Inches	MM	Inches
2 1/2	8.00	.315	1.85	.073
3	6.72	.265	1.65	.065
3 1/2	5.66	.223	1.45	.057
4	4.76	.187	1.27	.050
5	4.00	.157	1.12	.044
6	3.36	.132	1.02	.040
7	2.83	.111	.92	.036
8	2.38	.094	.84	.033
10	2.00	.079	.76	.030
12	1.68	.066	.69	.027
14	1.41	.0557	.61	.024
16	1.19	.0468	.54	.021
18	1.00	.0394	.48	.0187
20	.84	.0331	.42	.0165
25	.71	.0278	.37	.0146
30	.59	.0234	.33	.0129
35	.50	.0197	.29	.0113
40	.42	.0166	.25	.0098
45	.35	.0139	.22	.0085
50	.30	.0117	.188	.0074
60	.25	.0098	.162	.0064
70	.21	.0083	.140	.0055
80	.177	.0070	.119	.0047
100	.149	.0059	.102	.0040
120	.125	.0049	.086	.0034
140	.105	.0041	.074	.0029
170	.088	.0035	.063	.0025
200	.074	.0029	.053	.0021
230	.062	.0025	.046	.0018
270	.053	.0021	.041	.0016
325	.044	.0017	.036	.0014

# R. S. NEWBOLD & SON CO.

"Eagle Works"

Established 1852

Founders, Machinists, Boilermakers  
NORRISTOWN, PA.

## PRODUCTS

Rolling Mill Machinery, Shears, Punches, Bending Rolls, Plate Straighteners, Pipe Cutters, Flanging Machines, Etc.

Iron Castings, for Chemical industries up to 30 tons.

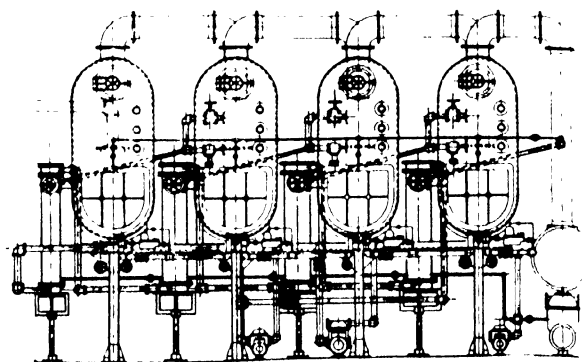
Steel Plate Work of every description, tanks, stacks, breechings, boilers, digesters, condensers, evaporators, vulcanizers, etc.

Machine Work and Pattern Work.

## FACILITIES

Our shops are in Norristown, on the main line of the Philadelphia & Reading R.R., 17 miles from Philadelphia. We have our own Foundry, Machine Shop, Boiler Shop and Pattern Shop and can therefore do every part of a job requiring a combination of steel plate work, castings and machine work. This enables us to be responsible for every part of the work and also makes possible a quicker delivery than we could make if we were dependent on outside sources of supply.

We are equipped to manufacture all kinds of chemical machinery and tanks both of cast iron and steel plate and guarantee the highest standard of workmanship and material.



"NEWHALL" QUADRUPLE EFFECT EVAPORATOR  
FOR BLACK LIQUOR

## SPECIAL MACHINERY

We specialize in apparatus for industrial and manufacturing processes built to customers' drawings. The services of our Engineering Department in the development of such apparatus is cheerfully offered.

## EVAPORATORS

We are builders and designers of the "Newhall" Evaporator which has been used for over 30 years in cane and beet sugar refineries, pulp mills, textile mills and other chemical processes. It is built in horizontal or vertical form as best suits the industry where applied. With the addition of recently patented features we believe this evaporator to be the smoothest running, most economical and most efficient machine built and respectfully solicit your inquiries on any evaporating equipment you may wish to install.



PART OF 850 TON CONTRACT FOR PONTONS AND DREDGE PIPE



EVAPORATORS UNDER CONSTRUCTION



VIEW OF PART OF BOILER SHOP



# NEW ENGLAND TANK & TOWER COMPANY

Manufacturers of Wood Tanks and Related Appliances  
for the Chemical Industries

EVERETT, MASSACHUSETTS

(BOSTON POSTAL DISTRICT)



## PRODUCTS:

Agitator Drives; Agitators; Agitator Fittings

Blow Cases; Blow Tanks

Cone Bottom Tanks

Dust Collectors

Dye Kettles

Filter Tanks (Gravity and Vacuum)

Half Round Tanks

Kiers

Montejus

Oval Tanks; Round Tanks

Settling Tanks

Sprinkler Tanks

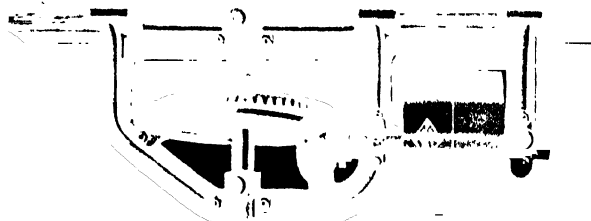
Spray Tanks

Storage Tanks

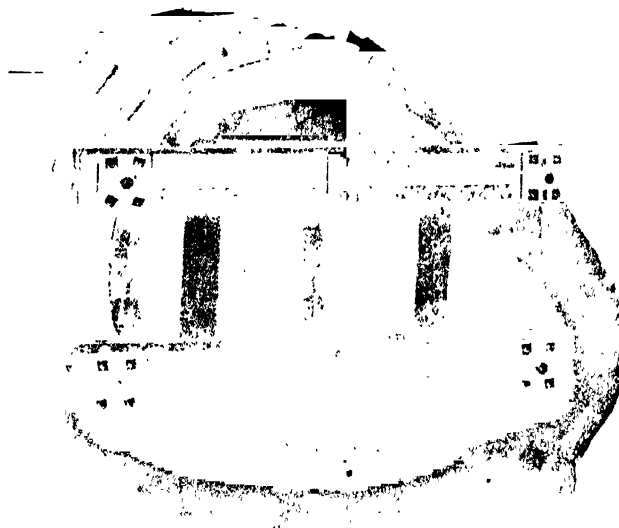
Vats

Steel Towers (for Storage and Sprinkler  
Tanks)

Tanks for Special Purposes.



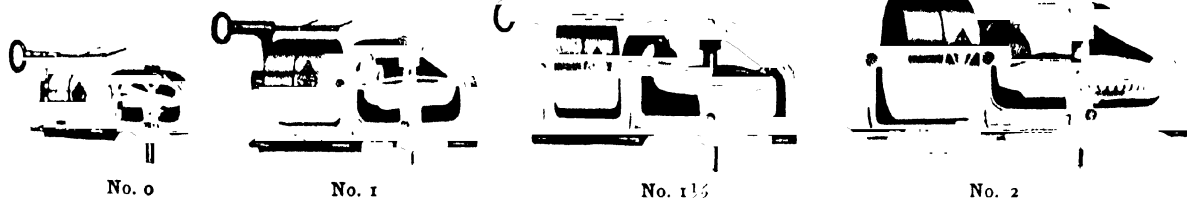
STANDARD DRIVE (SHOWING OVERHEAD MOUNTING)



WOOD PRESSURE TANK (DESIGNED FOR 50 LBS. PER SQ. IN.)

## SERVICE:

All inquiries will receive careful attention.



NO. 1  
BALL THRUST AGITATOR DRIVE (FOUR SIZES IN STOCK)

## DIMENSIONS

Size	Pinion Shaft	Gear Shaft	GEAR		PINION		T. and L. Pulleys	Length Over All
			P. Diam.	Face	P. Diam.	Face		
No. 0	1 1/4"	1 1/4"	8"	1 1/4"	2"	1 1/4"	8" x 3"	1'-11"
No. 1	1 1/2"	1 1/2"	13.37"	2"	3.34"	2"	12" x 4"	2'-9"
No. 1 1/2	1 7/8"	1 7/8"	16"	2 1/2"	4"	2 1/2"	12" x 4"	3'-2"
No. 2	1 3/4"	2 1/4"	23.87"	3"	5.97"	3"	18" x 5"	4'-2"

# NEW JERSEY FOUNDRY & MACHINE CO.

Manufacturers of Cranes, Trolleys and Hoists

90 West St.

NEW YORK, N. Y.

BRANCH OFFICE SAN FRANCISCO, CALIF., 156 SECOND STREET



## PRODUCTS

Cranes: Hand Power and Electric, Wall, Jib and Gantry.

Trolleys, I-Beam and Bar Type.

Portable Elevators.

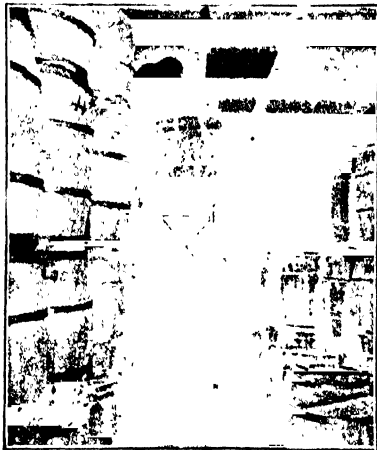
Equipment incidental thereto; Monorails.

## PORTABLE ELEVATORS

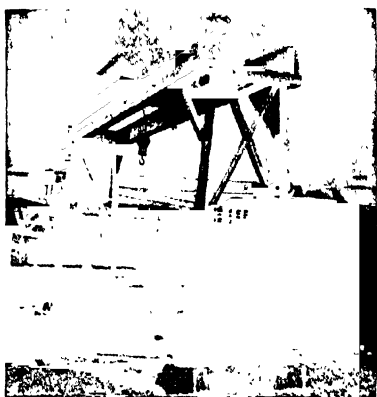
Standard sizes are  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$  and 1 Ton.

The standard over-all height is 12 ft., and standard size of platform is 2 ft. x 2 ft. x 7 ins.

Special capacities, heights and platform sizes made to comply with special requirements.



PORTABLE ELEVATOR PILING BARRELS



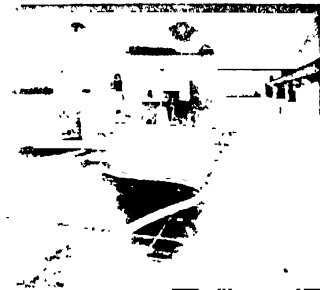
GANTRY CRANE WITH MOTOR DRIVEN TROLLEY HOIST

## CRANES

Motor Driven and Hand Power.

Standard or Special to suit.

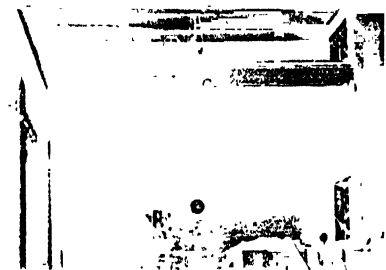
Practically Every Capacity and Span.



HAND POWER ICE CRANE WITH ELECTRIC HOIST



SPECIAL CRANE FOR WAREHOUSE



POWERHOUSE CRANE



MOTOR DRIVEN CRANE

## CATALOG

The New Jersey Foundry and Machine Co.'s standard size ( $7\frac{1}{2}'' \times 10\frac{5}{8}''$ ) Catalog No. 100, covering overhead traveling cranes, will be sent on request, also special catalog on "Delta" Portable Elevators, trolleys and wall cranes.

# NEW YORK BELTING & PACKING CO.

Manufacturers

## Mechanical Rubber Goods

New York, 91-93 Chambers St  
 Boston, 65 Pearl St  
 Chicago, 124-126 West Lake St  
 Philadelphia, 821-823 Arch St



Pittsburgh, 420 First Ave.  
 St. Louis, 218 220 Chestnut St  
 Salt Lake City, 313 1st Bldg  
 San Francisco, 519 Mission St.

### PRODUCTS

Belting—Transmission, Conveyor, Elevator, Acid Resisting.

Hose—Acid, Steam, Water, Air, Fire Protection, Vacuum, Chemical, Coke, Gas, Oil, Gasoline, Suction.

Packing—Sheet Rubber, Asbestos, Superheat, Piston, Hydraulic, Gaskets.

Pump Valves.

Grinding Wheels.

Special Molded Goods, rubber cement, tubing, laboratory stoppers, mats.

### TEST SPECIAL TRANSMISSION BELTING

The highest quality belting for all power transmission purposes; main drives, line shaft, counter shaft and machine drives.



HOT SAW DRIVE—TACONY STEEL CO., PHILADELPHIA  
 TEST SPECIAL RUBBER BELTING EXPOSED TO HEAT,  
 MOISTURE, SPARKS AND GRIT

Made from specially woven cotton duck of great tensile strength, the plies of which are inseparably bonded with a rubber friction that retains its adhesion under the hardest service. Waterproof, flexible, strong and durable. Withstands exposure to acid and chemical fumes, dust and grit. Has a friction surface which affords the maximum pulley grip.

Test Special Rubber Belting shows economy in initial cost and its freedom from stretch is a protection against trouble in operation.

### ACID RESISTING BELT

Especially designed for places where the belt comes in direct contact with acids and chemicals.

The construction is the same as **Test Special** with the addition of a thick rubber cover made of a tough rubber stock.

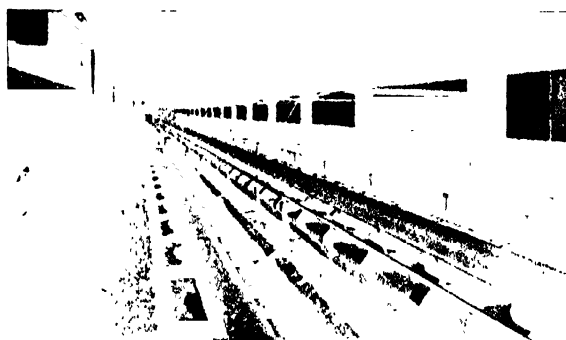
### INDESTRUCTIBLE CONVEYOR BELTING

Gives maximum service under conditions that make the use of ordinary belting more costly in the long run.

**Indestructible** possesses special features of particular value to the user.

The cotton duck has great tensile strength to with-

stand excessive strains—the rubber friction uniting the plies is particularly strong and tenacious with a remarkable ageing quality. As the life of a belt is

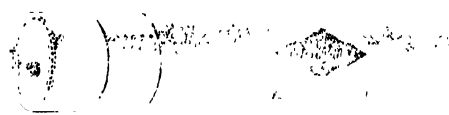


### INDESTRUCTIBLE CONVEYOR BELTING

usually the life of the rubber cover, great care is exercised in selecting and compounding the stock for the cover of **Indestructible** Belts. The rubber cover can be relied upon to retain a strong adhesion to the fabric and to remain pliable throughout the life of the belt.

### HOSE

For all classes of service, steam, water, air, acid, chemical, fire protection, gas, etc. Built on the **Indestructible** principle: Inner plies of wrapped duck over which is woven a fabric jacket of strong cotton yarns.



### INDESTRUCTIBLE HOSE

### PACKING

Packing for all purposes, steam, air, hot or cold water, acid, oil, chemicals, etc. Write us for packing catalog.

**Indestructible** White Sheet Packing is a rubber packing for general use. **Firo** Sheet Packing for superheat service. **Cobbs** Piston Packing for pressures to 150 pounds.

### PUMP VALVES

Rubber Pump Valves for acids, oils, ammonia, hot or cold water and a variety of other uses and pressures.

### VULCANITE GRINDING WHEELS

Emery bonded with rubber. Fast cutting, safe and economical.

### CATALOGS

We issue a general catalog covering all principal products and special catalogs on the following: Test Special Belting, Packings, Vulcanite Grinding Wheels, Pump Valves.

# NEW YORK CENTRAL IRON WORKS CO., INC.

Manufacturers of

Steel Tanks, Steel Plate Construction, and Equipment for  
the Chemical and Allied Industries

HAGERSTOWN, MARYLAND

## PRODUCTS

Steel Plate Construction for the Chemical and Allied Industries:

Agitators, Chemical  
Agitators, Oil Refining  
Agitators, Steel  
Bins, Coal, Coke and Ore  
Breechings, Boiler  
Chimneys, Self-Supporting  
Dehydrating Apparatus  
Hoppers, Elevator  
Kettles, Mixing  
Kettles, Steam Jacketed  
Pans, Evaporating  
Pipe, Hydraulic Riveted  
Pipe, Welded  
Still, for Crude Oils, creosote, coal, tar, etc.  
Soap Kettles  
Sugar and Syrup Kettles  
Air Ducts

Tanks of all kinds including:

Acid	Jacketed
Agitator	Mining
Air Compressor	Mixing
Bleaching	Pressure
Cone Bottom	Pulp
Cooling	Settling
Cyanide	Pulp Thickening
Digester	Sludge
Dissolving	Acid Separator
Dye	Soaking for Rubber
Fresh Water	Sprinkler System
Fertilizer	Storage
Fuel Oil	Sugar House
Gas Works	Tanners
Hydro-pneumatic	Water Softening

## SERVICES

To the chemical and allied industries particularly we offer ability to economically build from your most difficult specifications or cooperate with you in planning work on the most efficient yet practical basis.

## LOCATION

Our location at Hagerstown, Maryland, on the main line of the Pennsylvania system with direct connection with the Norfolk and Western, Western Maryland, and Baltimore and Ohio, is ideal for shipment to any part of the United States, especially to points in the eastern and southern states. We are also close to the seaports, which is an advantage in making export shipments.

## FACILITIES

We have large, well equipped shops, capable of producing Fifteen Hundred tons per month, and carry on hand, at all times, a large stock of steel plates, structural materials, rivets, etc.

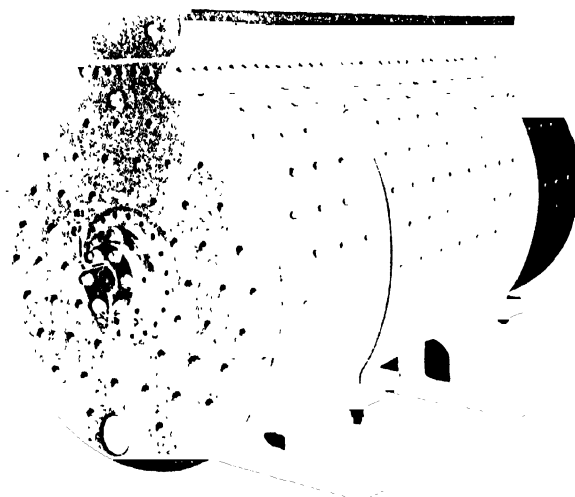
## INQUIRIES AND SPECIFICATIONS

Inquiries accompanied by specifications will receive our prompt and careful attention.

## ERECTION

We erect tanks and structural work anywhere in the United States of America.

**VERTICAL STILL**  
Constructed to customer's specifications



**OLEOMARGARINE CHURN**  
Constructed to customer's specifications



# NEW YORK THERMOMETER COMPANY

36 East 23rd Street

NEW YORK, N. Y.

FACTORY  
140 West 14th Street  
Brooklyn, N. Y.Cable Address  
"NYTHCO", New York

## PRODUCTS

Thermometers  
Hydrometers  
Pyknometers  
Saccharometers  
Hydrometer Jars and Cans  
Test Tubes

## THERMOMETERS

We manufacture all kinds of Thermometers for use in chemical laboratories, chemical manufacturing and industrial plants.

**Grades**—Laboratory, Standard and Extreme Precision, with or without armored cases.

**Types**—Our standard grade thermometers are made in three general types.

- With glass cylinder and enclosed, insulated paper scale.
- With glass cylinder and enclosed, insulated porcelain scale;
- With scale etched on stem.

### Laboratory Grade

High quality thermometers, carefully made, and primarily intended for routine work and other use where frequent breakage precludes the use of more expensive instruments.

#### LABORATORY THERMOMETERS

With engraved stems, or enclosed porcelain scales

Length	Graduations
12 inches	110° C. or 220° F.
12 "	150° C. or 300° F.
14 "	200° C. or 400° F.
14 "	250° C. or 500° F.
16 "	300° C. or 600° F.
16 "	360° C. or 700° F.
12 "	220° F. and 110° C.
12 "	300° F. and 150° C.
14 "	400° F. and 200° C.
16 "	600° F. and 300° C.
16 "	700° F. and 360° C.

### Standard Grade

For use in all work where readings to fractions of a degree are not required, but where, nevertheless, highly reliable, permanently accurate instruments are needed.

#### STANDARD GRADE THERMOMETERS

With engraved stems, or enclosed porcelain scales

Length	Graduations
15 inches	220° F.
15 "	300° F.
15 "	400° F.
15 "	600° F.
16 "	700° F.
16 "	800° F.
15 "	100° F.
15 "	150° F.
15 "	200° F.
16 "	360° F.
15 "	110° C. and 220° F.
15 "	150° C. and 300° F.
15 "	200° C. and 400° F.
16 "	300° C. and 600° F.
16 "	80° to 350° F. for Sulfite Mills

### Extreme Precision Grade

For use where extreme accuracy and refinement of indication are required, such as important laboratory or test work, and for checking less accurate thermometers.

We manufacture Allihn, Anschuetz, Beckmann and other thermometers in this grade. Specifications sent on request. Thermometers of extreme precision with special graduations made to order.

## HYDROMETERS

Are all hand graduated, adapted for every purpose. All these hydrometers, unless otherwise specified, are graduated for temperature 60° F. Made with printed scale, on request.

### Medium Grade

Of closer scales and somewhat less sensitive than the Standard Grade, adapted for most purposes.

### Standard Grade

Of greater sensitiveness, should always be used for close accuracy and for exact work.

We make a Hydrometer for every purpose in any of the usual scales, among which are:

Balling	Baumé
Brix	Kaiser
Proof	Traité

Where necessary a thermometer is incorporated with the hydrometer.

Hydrometers with special scales made to order.

Adaptability of our Hydrometers.

Our Hydrometers are used with constant success for Alcohol, Alkali, Ammonia, Calcium chloride, Caustic soda, Chlorine, Cider, Coal oil, Crude oil, Ether, Gasoline, Glue, Glycerine, Grape juice, Milk, Linseed oil, Naphtha, Oil, Petroleum, Salt, Sea water, Sugar, Syrup, Vinegar, Wine; for Specific Gravity, in the case of heavy liquids or light liquids; and for many other purposes.

## PYKNOMETERS

We produce the standard Pyknometer (Specific gravity bottle) with perforated stopper, unadjusted in three sizes.

10 cc.                      25 cc.                      50 cc.

We also furnish these Pyknometers, accurately adjusted at 20° C., capacities:

10 cc.                      25 cc.                      50 cc.                      100 cc.

Pyknometers adjusted at other temperatures produced at short notice.

Pyknometers with porcelain scale, centigrade thermometer, graduated to 1/5°, with capillary side-tube having a ground glass cap to prevent evaporation or overflow:

10 cc.                      25 cc.                      50 cc.                      100 cc.

## HYDROMETER JARS

Glass Hydrometer Jars with foot and lip suitable for use with our various Hydrometers are carried in stock in the following sizes:

Diameter	Height
1 1/2 inches	8 inches
2 "	10 "
2 "	12 "
2 "	14 "
2 "	16 "
2 "	18 "
2 1/2 "	18 "

## CATALOG

Illustrated Catalog and Price List sent on request.

# NORDBERG MANUFACTURING COMPANY

Designers and Builders of Engines, Mine Hoists, Compressors, Condensers, Chemical Machinery, and Special Castings for the Chemical Industry  
MAIN OFFICE AND WORKS: MILWAUKEE, WISCONSIN

## PRODUCTS

Diesel type stationary and marine engines; Corliss Engines and Uniflow Poppet Valve Engines; Steam, Air, and Electric Mine Hoists; Air and Gas Compressors; Blowing Engines, Vacuum Engines for multiple effect; Steam Stamps and Condensers; Special Machinery and Castings for the Chemical Industry.

## COMPRESSORS FOR CARBON DIOXIDE GAS

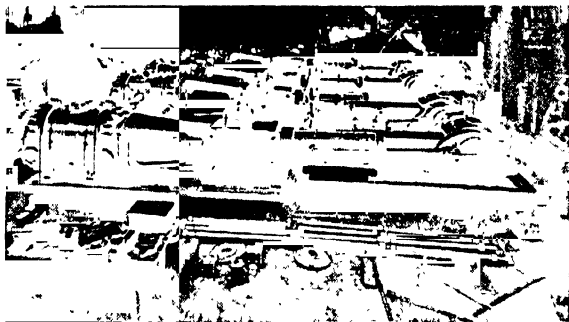
Two Nordberg Carbon Dioxide Gas Compressors were recently shipped to a large firm in China. They are of the duplex Corliss type, which compress the gas to 40 pounds with a steam pressure of 160 pounds and a back pressure of 10 pounds. Exhaust steam is used for heating. The capacity of each compressor is 3000 cu. ft. at 80 R.P.M. and they are provided with mechanically operated inlet valves, automatic poppet outlet valves, and other special features to enable them to handle gas containing impurities. Large sizes are provided with floating gas pistons, which are supported by front and back crossheads to eliminate wear.

These compressors are always built to meet special local requirements; in some instances the cylinders are provided with removable liners and the inlet valves with removable seats, so that these parts may be readily removed for re boring without dismantling the balance of the machine. In plants using superheated steam, the steam ends are provided with poppet valves. Most carbon dioxide compressors operate in plants requiring exhaust steam for heating, but in special cases, when desired, the steam ends are made condensing with the attendant low steam consumption.

The reliability and long experience in this special field of compressor manufacture were the factors which influenced this Chinese company in placing the order with the Nordberg Manufacturing Company.

## COMPRESSORS FOR NATURAL AND ARTIFICIAL GAS

Because natural gas contains a large amount of grit and other impurities, special attention has been given to the design of Nordberg Gas Compressors. Heavy duty cross-compound condensing steam engines are



**TWO NORDBERG DIOXIDE GAS COMPRESSORS RECENTLY SHIPPED TO A LARGE FIRM IN CHINA**  
The photograph was taken in the Nordberg factory during the final stages of shop erection

## NORDBERG



## MACHINERY

used, and the cylinders of the single stage compressor have poppet inlet and outlet valves. Nordberg builds this type of compressor in standard sizes up to 45" x 60". Large units use floating gas pistons to eliminate wear, tail gas being provided in front of and in back of each gas cylinder. The guides are bored to fit the shoes attached to the gas piston rods.

Some of the larger users of these compressors are the Carnegie Natural Gas Company, Morganahela Natural Gas Co., The Philadelphia Company, and the Pittsburgh & West Virginia Gas Company. Nordberg has built these special compressors for 25 years and have just completed seven cylinders for the last named company.

## HIGH-PRESSURE OXYGEN COMPRESSORS

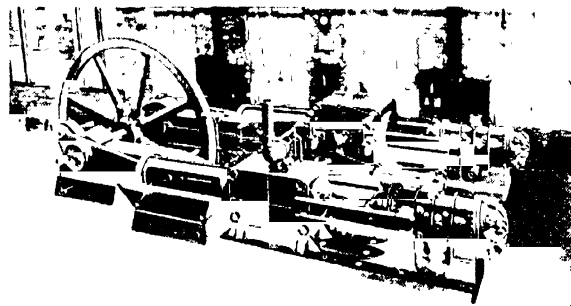
Among the many special types of compressors built for compressing various gases, the high pressure oxygen compressors are especially interesting.

These machines are of vertical, three-stage type and are capable of compressing the oxygen to 200 atmospheres. They are entirely self-contained, the three cylinders being mounted on a unit frame with the driving pulling at one end. Automatic poppet type valves are used and these are ground to fit on the seats. The cylinders, cylinder heads, valves and pistons are made of bronze. The cylinders are surrounded by water jackets and in the spaces between the cylinders and water jackets are immersed the coils which form the coolers between the several stages of compression. The frames of these special compressors are entirely enclosed and have removable plates for inspection of running gear and bearings.

## AIR COMPRESSORS

The range of types and sizes of Nordberg Air Compressors meet the demands of all requirements from low pressure single-stage to high pressure three- or four-stage. In units of one or two stages, a maximum capacity of 12,000 cu. ft. per minute can be provided.

Compound condensing or non-condensing Corliss engines are used for the steam ends and in cases where exhaust steam heating is employed, duplex Corliss engines are used. In modern plants using high pressure superheated steam, Nordberg Uniflow Poppet Valve



**A NORDBERG GAS COMPRESSOR, SUCH AS USED FOR COMPRESSING NATURAL OR ARTIFICIAL GAS**  
A heavy duty cross compound condensing steam engine is used to drive the two gas cylinders

*Continued on Next Page*



TWO NORDBERG UNIFLOW POPPET VALVE ENGINES DRIVING ROTARY BLOWERS AT THE LA CLEDE GAS LIGHT CO., ST. LOUIS, MO.

The uniflow Engine is especially suited to drive gas boosters and the speed of the engine is varied to meet requirements.

When these engines are used, the compressor being connected at the on-board end of the engine crankshaft.

Standard compressors are provided with Nordberg automatic inlet and outlet valves arranged in a cylindrical plug or seat so that the whole set of inlet or outlet valves may be removed as a unit.

Multi-stage compressors are provided with intercoolers and water-jacketed cylinders and cylinder heads. These Nordberg Air Compressors are driven by either Nordberg Diesel Engines, Uniflow Engines, or electric motors. The motors may be belted or direct connected, and when direct connected, the compressors are a high speed type to suit the motor requirements.

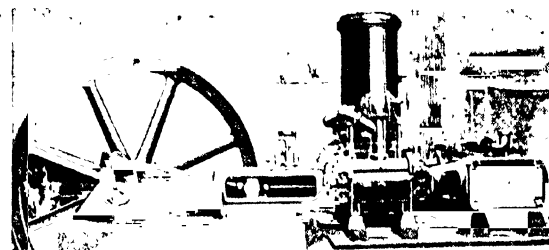
#### VACUUM ENGINES

In some branches of the chemical industry where a very high vacuum is required in the manufacturing process, Nordberg Vacuum Engines are employed. These multiple effect engines are built with special cylinders which, by means of a trick port, by-pass the air left in the clearance space from one end of the cylinder to the other. The cylinders are water-jacketed and have positive driven Corliss valves. A vacuum within a fraction of an inch of absolute may be produced. These Vacuum Engines for multiple effect are driven by cross-compound condensing or duplex non-condensing Nordberg Engines.

#### UNIFLOW ENGINES FOR ROTARY BLOWERS

Operators of modern gas plants, using high pressure superheated steam, realize the importance of installing engines especially adapted to these conditions. Where Nordberg Uniflow Poppet Valve Engines are employed to drive gas boosters, a steam consumption as low as 10 lbs. per I.H.P. hour is secured with high pressure and superheat. The rate of steam consumption does not vary more than 10 per cent from loads ranging from 50 to 125 per cent of normal. The efficiency, too, changes but slightly with variations in discharge pressure. When used for blower drive, Nordberg Uniflow Poppet Valve Engines are equipped with a device which varies the speed of the engine to meet the blower capacity required.

These engines are widely used for driving generators and other constant speed machinery, as well as a large variety of variable speed machines. They are built in several sizes, ranging from 200 to 1300 H.P. for single cylinders. The speed of the smaller standard sizes is 200 R.P.M. and the larger sizes 120 R.P.M. Variations from these speeds can be made to suit special conditions and the engine may be operated either con-



A NORDBERG COMPOUND CONDENSING CORLISS ENGINE DRIVING A NORDBERG TWO STAGE AIR COMPRESSOR WITH LARGE INTERCOOLER

Nordberg Air Compressors may be driven by Corliss, Uniflow or Diesel Engines or by motors, as conditions warrant.

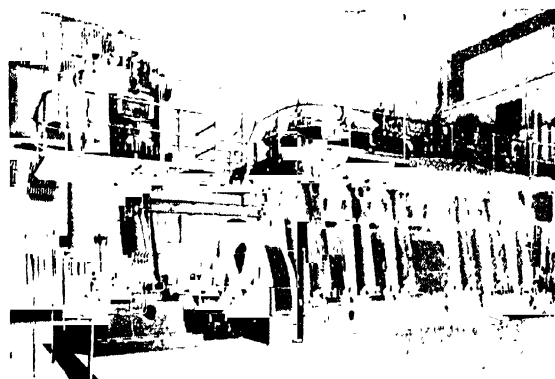
densing or non-condensing, or with high back pressure and with any steam pressure and superheat. A Nordberg Uniflow Poppet Valve Engine operating under any of these conditions will maintain a lower steam consumption over wider variations in load than any other form of steam prime mover.

#### DIESEL TYPE OIL ENGINES

Nordberg Diesel type oil engines are especially adapted for heavy duty work, and range in sizes from 300 to 3000 B.H.P. For stationary service they are used extensively in electric light and power plants, flour mills, mining industries, machine-shops, textile works, cement industries, water works, shipyards, chemical works, refineries, compressor plants, irrigation plants, ice manufacture, etc. Nordberg Diesel engines are made for either constant or variable speed and burn a large variety of fuel oils with exceptional economy. Particular attention is called to the large sizes of Nordberg Diesel units.

#### SPECIAL MACHINERY

The Nordberg Manufacturing Company has built a large number of compressors for special purposes, such as oxygen compressors for 200 atmosphere pressure, hydrogen and nitrogen circulators, vacuum engines for multiple effect; evaporators and air expansion engines for production of extremely low temperature; and many large and special castings for use in the chemical industry. The company is prepared to build large and special machinery to meet unusual requirements. State the conditions to Nordberg.



A NORDBERG AIR COMPRESSOR HAVING ONE VERTICAL AND ONE HORIZONTAL CYLINDER DRIVEN BY A NORDBERG DIESEL ENGINE

This installation was made for the Detroit Copper Company at Morenci, Arizona

# NORRISTOWN MAGNESIA & ASBESTOS COMPANY

## NORRISTOWN, PA.

### PRODUCTS

**Asbestos Pipe and Boiler Coverings and Cements, Asbestos Board, Paper, Packing, Yarns, Twine, Cloth, Tubing, Clothing, Gaskets.**

### PIPE COVERINGS

We furnish pipe coverings for a wide range of applications to steam and water pipes.

#### Asbestos Magnesia

A sectional Covering for High and Low Pressure Steamwork; of solid construction, light in weight, particularly strong and easily handled with small breakage. Uninjured by being water soaked, if allowed to dry without being disturbed.

**"Ideal"**—For high pressure work, also for pipe lines exposed to weather when waterproofed. Made up of our standard magnesia asbestos with a  $\frac{1}{2}$ " jacket of wool felt added. This jacket of Wool Felt, being applied by the broken joint method over the inner core of Asbestos Magnesia, gives a much higher efficiency and also serves as an excellent protection to the inner core against breakage and hard usage.

**Air Cell**—For medium pressure, low pressure and hot water work. This covering is made up of our special corrugated asbestos paper. It is a nonconductor, thoroughly fireproof and almost indestructible. Full quarter inch to the ply with small corrugations. Made in 3- and 4-ply, making  $\frac{3}{4}$ " and 1" thicknesses respectively. Thicker if desired.

**"Conomie"**—This covering differs from Air Cell by being reinforced by a backing of  $\frac{1}{4}$ " specially prepared solid asbestos. This backing makes it more efficient and durable than Air Cell. We recommend using 2-ply for exposed riser work and 4-ply for high pressure lines.

**Indent**—Adapted for use wherever excessive vibration is to be provided for. Made up from our asbestos paper, which has been indented previous to rolling. This is one of the most substantial coverings that we have produced, its particular qualities being efficiency and durability.

**Asbestos Felted**—Made up similar to Indent, except the asbestos paper is rolled flat. This is an exceedingly hard, heavy, durable covering, the walls being practically pure solid asbestos fibre.

ASBESTOS MAGNESIA COVERING

"IDEAL" COVERING

**Felt**—For hot water work. Made any thickness of a body of superior wool felt. Lined inside with asbestos paper. This covering has proved an exceptional non-conductor for all low temperature heat work. We recommend  $\frac{3}{4}$ " thickness for hot water work.

**Sweatproof**—Particularly adapted for cold water lines through warm or damp rooms to prevent sweating and dripping. Made by our special process, from a special quality of wool felt and is lined with tarred paper.

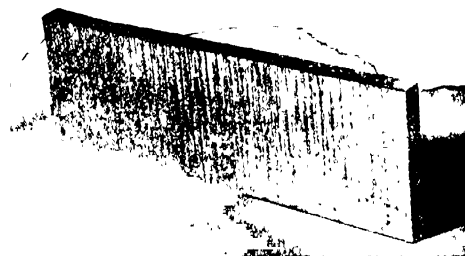
**Cold Water Pipe**—For exposed pipe lines. Made from the highest quality of wool felt, and is lined with the thickest, heaviest grade of tarred paper.

**Frostproof**—For out door pipe lines exposed to the severest weather. Composed chiefly of hair felt and wool felt. Fittings should be lapped securely with hair felt and canvas. This covering gives exceptional protection to out-door water lines, protecting them from frost.

FROSTPROOF COVERING

### BLOCK, BOARD AND PAPER

**Asbestos Magnesia Block**—For covering large pipes, heaters, stacks, boilers and flat surfaces. These blocks contain virtually the same materials as our high pressure coverings, except that asbestos fibre of extra length is used to give all possible strength. Made 6" x 18" x 1",  $1\frac{1}{2}$ " or 2", 3" x 18" x 1",  $1\frac{1}{2}$ " or 2".



ASBESTOS MAGNESIA BLOCK

**Asbestos Air Cell Block**—Indented Board—"Conomie" Board—Mill Board—Acidproof and fireproof. For lining walls and ceilings and covering hot surfaces.

**Asbestos Paper**—Plain and corrugated. Made of pure asbestos. For covering hot air pipes and flues, and for use where a thin pliable covering is required. A good rust preventive.

### CEMENT

This cement is made of asbestos fibre, magnesia, infusorial earth, and other selected ingredients to insure strength and non-conduction of heat.

# NORTON COMPANY

MAIN OFFICE AND WORKS  
WORCESTER, MASS.

ELECTRIC FURNACE PLANTS  
Niagara Falls, N. Y.  
Chippawa, Ontario, Canada

BRANCH OFFICES  
11 N. Jefferson St., Chicago  
231 W. Congress St., Detroit  
141 Chambers St., New York

## PRODUCTS

Alundum and Crystolon Refractories and Laboratory Ware, Grinding Wheels, Abrasive Grain, Alundum Safety Tile, Abrasive Bricks and Stones and Grinding Machinery.

## REFRACTORIES AND LABORATORY WARE

Crucibles	Muffles
Combustion Boats	Tubes
Crucibles	Pyrometer Tubes
Cores	Refractory Cements
Dishes	"RR" Alundum
Extraction Thimbles	(Crystalline Alumina)
Filter Plates	Sintered Magnesias

## "ALUNDUM" REFRACTORIES

Electrically fused Alumina ( $Al_2O_3$ ), melting point  $2550^{\circ}C$ , is important as a Refractory as well as an abrasive. This electric furnace product is of different degrees of purity depending on intended use. The purest forms run not less than 99% aluminum oxide. The less pure grades contain small amounts of the oxides, iron, titanium and silicon. Its specific gravity is 3.91 and specific heat 0.195 to 0.198 at  $100^{\circ}C$ .

Through proper selection of ceramic bonding materials and heat treatment refractory articles are made having a melting point somewhat less than pure alumina depending entirely on the mixture.

Alundum bonded ware is relatively strong, has a high heat conductivity and an electrical resistance at high temperatures greater than the usual refractory materials. On account of these properties and its inertness toward resistors of platinum, molybdenum, nickel and its alloys, various shapes are used in heating devices.

Except in the case of Pyrometer tubes Alundum ware is porous and used in the filtration of acids and gases and also for the diffusion of gases. Three porosities available in crucibles, thimbles and filter cones.

## "CRYSTOLON" REFRACTORIES

Silicon Carbide ( $SiC$ ) is formed in electric furnaces of the resistance type at temperatures between  $1820^{\circ}C$  and  $2250^{\circ}C$  from pure silica sand, coke and small quantities of salt and sawdust. At about  $1500^{\circ}C$ , Crystolon firesand, a soft dark green colored substance having useful refractory properties is formed. This is converted as the temperature increases into Crystalline  $SiC$ , the crystals of which are beautiful in iridescent colors. Above  $2250^{\circ}C$ , silicon vaporizes from the compound, leaving a residue of graphite.

Silicon Carbide having a high heat conductivity is valuable on this account and also on its high dissociation point,  $2250^{\circ}C$ .

When made up into muffles, furnace tile and parts, proper ceramic refractory bond clays produce "Crystolon" ware that is not readily oxidized and only attacked by hydrofluoric acid. At high temperatures metallic oxides, alkali compounds and strong alkalis attack it.

### PROPERTIES OF NORTON REFRACTORIES

	"Alundum" Ware	"Crystolon" Ware
Electrical Resistance in Megohms	1.30 at $325^{\circ}C$ 16 at $730^{\circ}C$ 5.1 at $892^{\circ}C$ 1.8 at $1020^{\circ}C$	31.8 at $320^{\circ}C$ 6.1 at $650^{\circ}C$ 3.2 at $809^{\circ}C$ 1.9 at $910^{\circ}C$ 0.1 at $1010^{\circ}C$
Melting Point	less than alumina depending on mixture	decomposed at $2250^{\circ}C$
Coefficient of expansion	0.000071 per $^{\circ}C$	0.000045 $^{\circ}C$

## ELECTRICALLY SINTERED MAGNESIA

This material is prepared from the best grade of California Magnesite in an electric furnace. Further shrinkage is eliminated as maximum density has been attained, 3.65. It is attacked by carbon at about  $1800^{\circ}C$ . Its general chemical properties are similar to "dead burned" Magnesite. The melting point varies according to purity, between  $2300^{\circ}$  and  $2700^{\circ}C$ . This product can be supplied in lump or crushed form. It is used in making magnesia crucibles and basic refractory linings.



MUFFLES

CORES

PYROMETER  
TUBE

CRUCIBLES

CEMENT  
DISCS"RR"  
ALUNDUM

DISH

CONES

THIMBLES  
COMBUSTION BOATS

TUBES

# THE OAKLAND COPPER & BRASS WORKS

Cable Address  
ZEITLER  
APC 7th Floor

Chemical Engineers and Constructors  
GENERAL OFFICES AND WORKS  
OAKLAND, CALIFORNIA, U. S. A.

Philadelphia  
3519 North

## PRODUCTS

Evaporators  
Distilling Apparatus  
Extractors  
Vacuum Pans  
Kettles

## Condensers

Solvent Recovery Apparatus  
Special Chemical Machinery  
Tin and Lead Lined Apparatus  
Coppersmithing

## SERVICES

We design, build and install all types of apparatus for evaporating, distilling, pasteurizing, heating, cooling, and condensing for practically all products handled in the canning, packing, milk products, food products, chemical and allied industries.

## EVAPORATORS

We design and construct apparatus of any capacity for all products, in single or multiple effects, to work under pressure or vacuum. Our machines are properly designed and constructed to give a maximum efficiency both as regards evaporation and cooling water consumption.



**SINGLE EFFECT VERTICAL TUBE VACUUM EVAPORATOR WITH SURFACE CONDENSER AND DRY VACUUM PUMP**

We offer, gratis, for experimental purposes the use of the above illustrated high vacuum concentrating equipment, including also an agitated vacuum Finishing Pan (similar to that illustrated in the cut of the Fruit Butter installation) for heavy concentrates. Details will be furnished upon application.

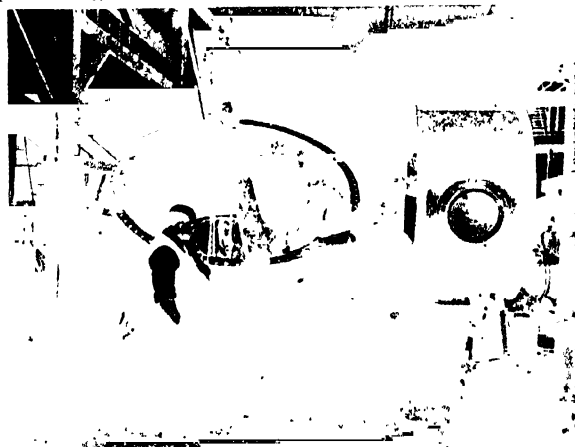


**A FRUIT BUTTER INSTALLATION**

Consisting of a single effect vertical tube vacuum evaporator for the initial concentration, and a steam-jacketed agitated vacuum finishing pan for making the finished product.

## VACUUM PANS

Our Pans are of the Jacket or of the Coil types and are built in all sizes. We have designed and built many special types of Pans to suit customer's requirements. Our special steam jacketed Mixing Vacuum Pan having a steam heated revolving coil fitted with scrapers and carried on a horizontal shaft, the coil acting both as a heating unit and an agitator, obtains without difficulty a degree of concentration approaching a solid.

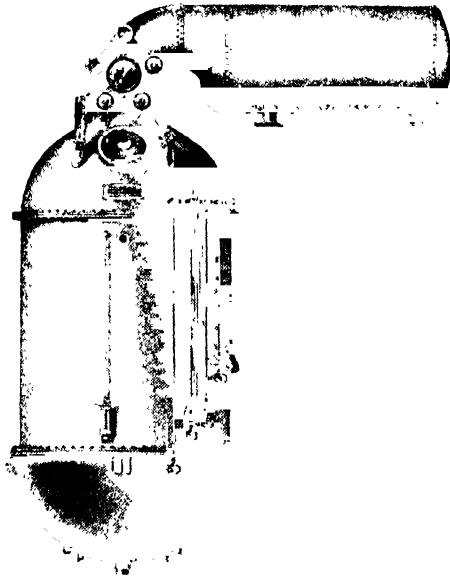


**STEEL SHELL, "ZEITLER" LEAD-LINED COIL HEATED VACUUM PAN**

Detail at top illustrates Zeitler method of lining. Patented January 22, 1918

*Continued on Next Page*

other special apparatus as illustrated in the accompanying illustration is a vacuum pan of steel with "Patented Homogeneous Lead Lining and coil heating coils. Several of these Pans have been in service concentrating citric acid since early in the century, and they do not show a tendency to sag, creep or separate from the outer shell. This kind of service can be readily appreciated by those who have had experience in operating under a vacuum the ordinary type of apparatus wherein the lining is simply soldered to the outer shell.



**VACUUM PAN AND CONDENSER**  
For Manufacture of Evaporated and Condensed Milk

#### EXTRACTORS

We construct extraction apparatus of the batch type with apparatus for the recovery of solvents; also, of the continuous diffusion battery type.

#### KETTLES

We build all sizes and types of Jacket Kettles, Mixing Kettles, Tilting Kettles, etc.

The illustration shows part of a single installation of 32 350-gallon copper jacket kettles which were lined with pure block tin a quarter of an inch thick.

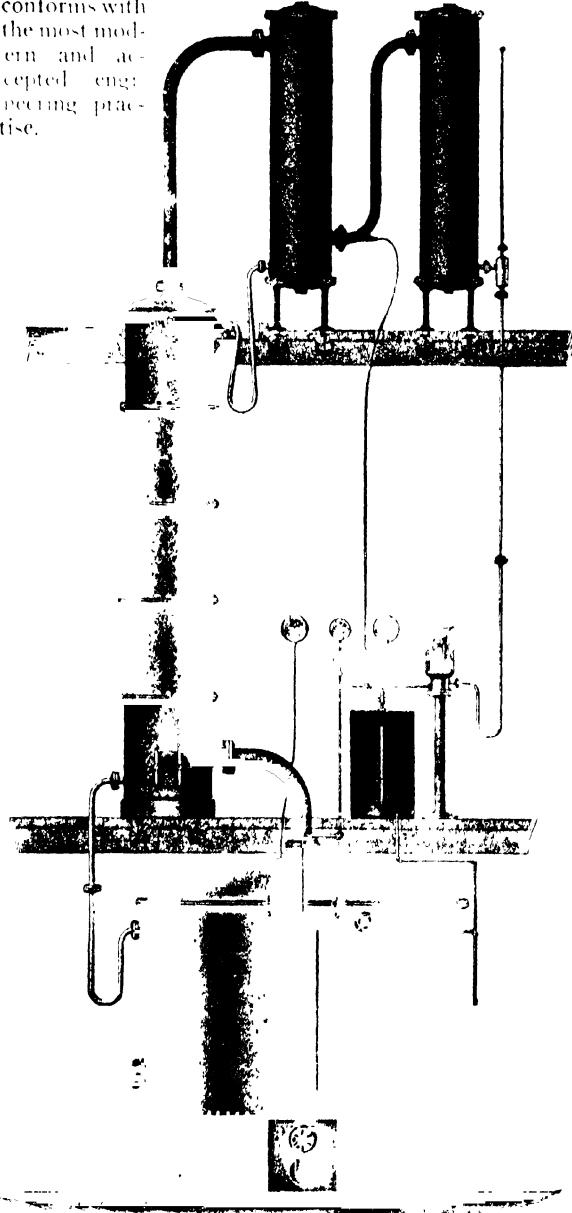


**350-GALLON COPPER JACKET KETTLES**

#### DISTILLING APPARATUS

Illustration shows a periodic refining still of copper. We build all types of distilling apparatus, continuous

or periodic, to operate either under a vacuum or at atmospheric pressure, to handle almost any volatile liquid, and constructed of the proper material for the liquid being handled. The design of our apparatus conforms with the most modern and accepted engineering practice.



**PERIODIC REFINING STILL**

#### SPECIAL APPARATUS

We are equipped both from an engineering and a manufacturing standpoint, to design and build any kind of special apparatus as used in the chemical and allied industries. We operate the largest copper and brass working shop in the West, and our Chemical Engineering Department working in conjunction with the manufacturing end assures our clients the most efficient service obtainable. We invite inquiries for anything from a single piece of apparatus to a completely installed plant.

# O'MALLEYS COOPERAGE, INC.

Berry and North 13th Streets

BROOKLYN, N. Y.

Telephones — GREENPOINT 2-5514, 2-5515

## PRODUCTS

Barrels, Slack and Tight  
Kegs and Casks  
Wood Tanks, Vats and Drums  
Cooperage Stock  
Packing Cases and Shooks  
Bag Coverings

## BARRELS

As we maintain a large supply of cut stock and second hand barrels we are at all times in a position to supply or ship on short notice new barrels, set up or knocked down, or second hand barrels, either tight or slack. Our barrels are of the standard woods and sizes.

## COOPERAGE

We have several crews of men who are always ready to go to piers and terminals to recondition barrels loosened up in transit.

We also contract to barrel, in the New York Harbor district, export shipments made in bulk by manufacturers at interior points. This service costs no more than barreling at the plant, and saves the rail freight on barrels. It also permits loading heavier cars, and loading them quicker.

This same class of service is rendered importers receiving bulk cargoes for re-shipment by rail to interior points. The savings and advantages are the same in this case as for export.

All that is necessary to do to have us undertake cooperage service is send your order with dock receipt or bill of lading and shipping instructions. We take care of the trucking and advancement of freight charges, billing for the entire job on one itemized bill.

It will be of advantage to shippers and receivers of bulk shipments to investigate the cost, savings and advantages of this service as against shipping in barrels the entire distance.

We will also handle shipments received in barrels where re-shipment is to be made in bulk. In this case we will make allowances for barrels, depending on their condition, and deduct from our bill for service.

## TANKS

We build complete tanks to specification, working from drawings supplied by customer. O'Malley tanks are built of any size and in any shape that it is practical to construct wooden tanks.

Our tank stock is cut from well seasoned timber and allowed to finish seasoning before being built into tanks.

We maintain a large supply of the best woods available for tank construction, cypress, redwood, cedar.

Each tank is properly banded or braced to withstand internal and external strains and stresses.

Where tanks are to be fitted with spouts, stirrers, agitators or other devices and accessories we will purchase the equipment specified and fix it in place in a proper manner. Where no special make of fitting or accessory is ordered we purchase the best obtainable.



SECTION OF COOPERING SHED



HOGSHEADS PREPARED FOR EXPORT



# JOSEPH OAT AND SONS

Established 1788

Coppersmiths, Machinists, and Brass Founders

228-234 Quarry Street

PHILADELPHIA, PA

## PRODUCTS

Every Kind of Copper Chemical Equipment.

Especially,

Vacuum Pans

Milk Condensing Pans

Multiple Effect Evaporators

Vacuum Concentrating Apparatus

Dreg Stills

Vacuum Distilling Apparatus of all Kinds

Stills, Vacuum

Stills, Dreg

Surface Condensers

Tanks, Storage

Tanks, Mixing

Tanks, Pressure

Tanks, Heating

Tanks, Cooling

Tanks, Dissolving

Vats, Copper

Also,

Coils, Condensing

Coils, Heating

Columns, Fractionating

Condensers

Copper Tanks

Digestors

Distilled Water Equipment

Extractors

Jacketed Tanks

Jacketed Kettles

Jacketed Stills

Jet Condensers

Kettles for all Purposes

Kettles, Mixing

Kettles, Varnish

Kettles, Vacuum

Kettles, Steam Jacketed

Milk Forewarmers

Percolators

Rotary Coil Vacuum Pans for Solid Extract

Solvent Recovery Apparatus

Stills, Water

## VACUUM PANS

Our Vacuum Pans range in size from sixteen inches in diameter for laboratory experimental purposes to sixteen feet in diameter for sugar manufacturers.

Vacuum Pans for milk and other food products a specialty.

We build vacuum stills for pharmaceutical laboratories with or without receivers for recovered distillate, and for aqueous or alcoholic solutions.

Single or double stirring devices are supplied when desired.

## EVAPORATORS

Single and multiple effect evaporators for tanning extracts, calcium chloride, caustic soda, licorice and sugar solutions.

Evaporating apparatus designed for special products.

Our evaporators are designed to facilitate rapid circulation and evaporation without entrainment, with ample vapor areas avoiding excessive vapor speed, large drain connections and provision for elimination of air from heating chambers.

# OLIVER CONTINUOUS FILTER COMPANY

505 Market Street  
SAN FRANCISCO, CALIF.

11 Southampton Road  
London, W. C. 1

Laboratory, 503 Market Street

33 West 42nd Street  
New York

Cable Address "OLICONFILT"

Laboratory, 226 East 41st St.

## PRODUCTS

Continuous Automatic Vacuum Filters for separating liquids from solids; Horizontal Continuous Filter Tables, Vacuum Pumps, Centrifugal Pumps, Air Compressors, Acid Pumps.

## GENERAL DESCRIPTION

The Oliver Continuous Filter consists of a drum or cylinder, revolving partially submerged in an open tank containing the material to be filtered. The surface of the drum is divided into shallow compartments, being supported underneath by a screen and held in place and protected from wear by a wire winding, the use of which is covered by our patents.

Each section of the drum is connected by a pipe passing through a hollow trunnion to an automatic valve, which controls both the application of vacuum for forming and washing the cake, and the admission of air for its discharge and for cleansing the filter medium. Provision is made for applying such washes to the cake as may be needed for complete replacement of solution. The main filtrate may be kept separate from wash solution with no extra labor.

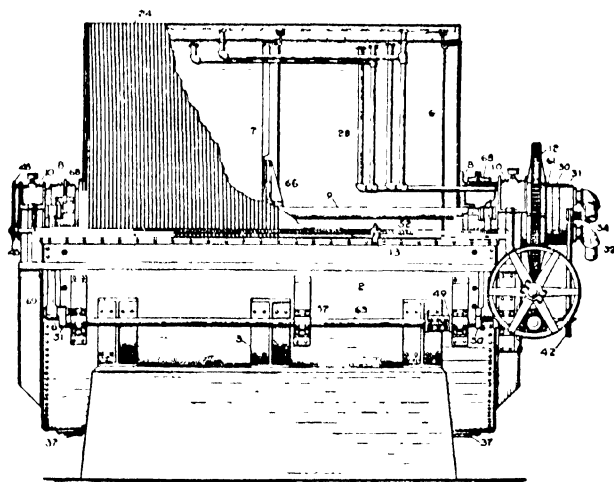
A scraper fitted across the tank rests on the wire winding in such a manner that the cake is entirely removed after being released by air.

An agitator suitable for the material to be filtered is placed in the bottom of the tank to keep the heavier particles in suspension, and to insure a uniform and homogeneous mixture.

Provision may be made for heating the pulp in the filter tank or to prevent any loss of heat due to radiation. Losses or increases of temperature are easily prevented.

## WASHING FILTERS

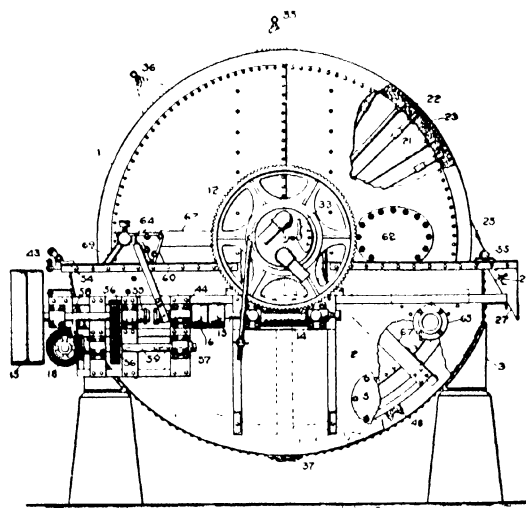
Used where filtration and efficient washing are desired as in the filtration of caustic soda from lime sludge, or the separation of any Alkaline or Acid Solutions from precipitates. In the filtration of both Hot and Cold Saccharate and First Carbonation Juice in Beet Sugar Factories. For the separation of Bicarbonate of Soda, Salt and other crystals from mother liquors, Nitrate of Soda from caliche, etc., and for the recovery of cyanide solution in the reduction of gold and silver ores. Used extensively in factories producing Starch, Glucose, Caustic Alkalies, Dyes, Pigments, Phosphate of Lime, etc.; also in Clay preparation and oil clarification in oil refineries.



FILTER WITH OSCILLATING AGITATOR AND ENCLOSED HEADS

### List of Parts

- |                              |                          |
|------------------------------|--------------------------|
| 1. Filter Drum               | 18. Bevel Gears          |
| 2. Steel Filter Tank         | 21. Wood Staves for Drum |
| 3. Tank Supports             | 22. Division Strips      |
| 5. Tank Manhole              | 23. Filter Medium        |
| 6. Channel Steel Drum Rims   | 24. Wire Winding         |
| 7. Channel Steel Drum Arms   | 25. Steel Scraper        |
| 8. Hollow Cast Iron Trunnion | 26. Scraper Adjuster     |
| 9. Steel Drum Shaft          | 27. Apron                |
| 10. Main Bearings            | 28. Vacuum and Air Pipes |
| 12. Worm Drive Gear          | 30. Removable Valve Seat |
| 13. Worm Shaft               | 31. Automatic Valve      |
| 14. Oilwell for Worm         | 32. Vacuum Connections   |
| 15. Drive Pulleys            | 33. Air Connection       |
| 16. Wiring Pulleys           | 34. Valve Stem           |



FILTER WITH OSCILLATING AGITATOR AND ENCLOSED HEADS

### List of Parts

- |                           |                               |
|---------------------------|-------------------------------|
| 35. Wash Water Sprays     | 55. Scraper Bearings          |
| 36. Wash Solution Sprays  | 56. Spur Gear                 |
| 37. Drain Flange          | 57. Oscillator Shaft Bearings |
| 42. Valve Adjuster        | 58. Pulley Shaft              |
| 43. Wire Spacing Nut      | 59. Intermediate Shaft        |
| 44. Worm Shaft Bearings   | 60. Clutch Shifter            |
| 45. Wiring Sprockets      | 61. Valve Pipe Plate          |
| 48. Oscillator Rakes      | 62. Drum Manhole              |
| 49. Shaft Coupling        | 63. Oscillator Shaft          |
| 50. Agitator Crank        | 64. Connecting Rod Bracket    |
| 51. Agitator Crank        | 65. Overflow Weir             |
| 52. Wiring Feed Screw     | 66. Center Spider             |
| 53. Jaw Clutch            | 69. Connecting Rod            |
| 54. Wiring Screw Bearings |                               |

Continued on Next Page

# JOSEPH OAT AND SONS

Established 1788

Coppersmiths, Machinists, and Brass Founders

228-234 Quarry Street

PHILADELPHIA, PA

## PRODUCTS

Every Kind of Copper Chemical Equipment.

Especially,

Vacuum Pans

Milk Condensing Pans

Multiple Effect Evaporators

Vacuum Concentrating Apparatus

Dreg Stills

Vacuum Distilling Apparatus of all Kinds

Stills, Vacuum

Stills, Dreg

Surface Condensers

Tanks, Storage

Tanks, Mixing

Tanks, Pressure

Tanks, Heating

Tanks, Cooling

Tanks, Dissolving

Vats, Copper

Also,

Coils, Condensing

Coils, Heating

Columns, Fractionating

Condensers

Copper Tanks

Digestors

Distilled Water Equipment

Extractors

Jacketed Tanks

Jacketed Kettles

Jacketed Stills

Jet Condensers

Kettles for all Purposes

Kettles, Mixing

Kettles, Varnish

Kettles, Vacuum

Kettles, Steam Jacketed

Milk Forewarmers

Percolators

Rotary Coil Vacuum Pans for Solid Extract

Solvent Recovery Apparatus

Stills, Water

## VACUUM PANS

Our Vacuum Pans range in size from sixteen inches in diameter for laboratory experimental purposes to sixteen feet in diameter for sugar manufacturers.

Vacuum Pans for milk and other food products a specialty.

We build vacuum stills for pharmaceutical laboratories with or without receivers for recovered distillate, and for aqueous or alcoholic solutions.

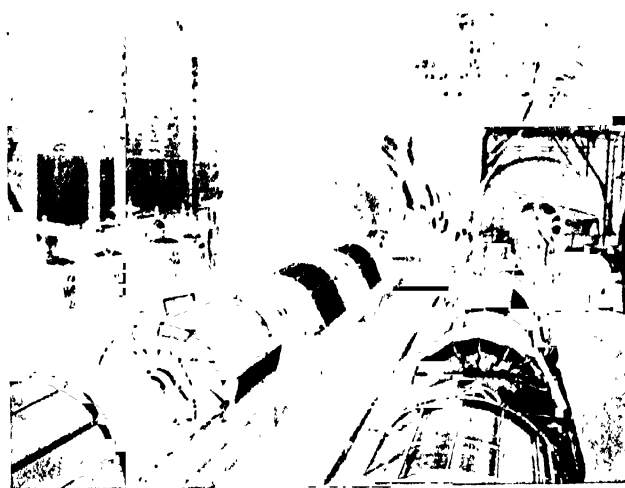
Single or double stirring devices are supplied when desired.

## EVAPORATORS

Single and multiple effect evaporators for tanning extracts, calcium chloride, caustic soda, licorice and sugar solutions.

Evaporating apparatus designed for special products.

Our evaporators are designed to facilitate rapid circulation and evaporation without entrainment, with ample vapor areas avoiding excessive vapor speed, large drain connections and provision for elimination of air from heating chambers.



**A TYPICAL INSTALLATION IN STEFFENS HOUSE OF A BEET SUGAR FACTORY**

Ten 11'6" x 12', eight 1'0" x 6' and two 5'4" x 4' filters at Spreckels Sugar Factory, Spreckels, Cal.

### OLIVER FILTER SIZES

Filters in any of following sizes will be built to suit the individual requirements of any plant on receipt of full particulars.

Diameter	Length	Area Sq. Ft.	Diameter	Length	Area Sq. Ft.
3'0"	0'6"	4	8'0"	10'0"	250
3'0"	1'0"	9	8'0"	12'0"	300
3'0"	2'0"	18	11'6"	8'0"	288
3'0"	4'0"	36	11'6"	10'0"	360
4'0"	2'0"	25	11'6"	12'0"	432
4'0"	4'0"	50	11'6"	14'0"	504
4'0"	6'0"	75	11'6"	16'0"	576
5'4"	4'0"	70	11'6"	18'0"	648
5'4"	6'0"	105	11'6"	20'0"	720
5'4"	8'0"	140	11'6"	24'0"	1056
5'4"	10'0"	175			
5'4"	12'0"	210			
8'0"	6'0"	150			
8'0"	8'0"	200			

### CAPACITIES

The quantity of solid or liquid that can be handled per unit of filter area depends upon many factors, all of which have to be considered when estimating the size of filter required. The most essential data are the physical condition of the solids, whether granular or colloidal, size of particles, ratio of solids to liquid, and temperature at which filtration is to be conducted.

Following are the average amounts of dry solids that can be handled in 24 hours on one square foot of Oliver Filter surface:

Ore slime, 400 lbs.  
Flotation concentrate, 600 lbs.  
Cold saccharate from 200 lbs. molasses  
Hot saccharate from 1200 lbs. molasses  
Bicarbonate of soda, 2500 lbs.  
Calcium carbonate in causticizing plants, 750 lbs.  
Prepared clay for oil refining, 600 lbs.  
Lubricating oil, clarified, 240 gals.  
Maltose sludge, 160 gals.  
Paper pulp, 500 lbs. dry pulp.  
Starch, 1200 lbs.

### ADVANTAGES

Continuous and automatic in action without labor in cycle of formation, washing, drying, or discharge cake. All stages visible, accessible and easy of adjustment. Economy of labor, power, cloth and repair. High washing efficiency with a minimum of wash water. Filters effectively either hot or cold.

### OPERATING COSTS

Depend on tonnage and nature of material handled, but range from 3c to 5c per ton of dry solids. Maintenance and cloth renewals 1/4c to 1/2c.

### WASHING EFFICIENCY

The Oliver system of applying an atomized wash over the uniform and relatively thin cake which is always in sight of the operator, insures a maximum replacement of the original liquor with a minimum of wash water. Repeated competitive tests on large scale with other types of filters indicate a saving of from 100% to 300% in quantity of wash water used to obtain equally thorough wash. A clean separation of main filtrate and wash solution is automatically made.

### USES IN METALLURGICAL PLANTS

Originally developed for the filtration of slime in cyanide plants, the use of the Oliver Continuous Filter has been rapidly extended to the chemical and industrial fields. Scarcely a cyanide plant has been installed in America during the past five years that has not included an Oliver Filter. There are now more Oliver filters in use in gold and silver mills of the United States, Canada and Mexico than all other types of filters combined.

The worldwide application of the Oliver for dewatering concentrate produced by the Oil Flotation Process in the treatment of copper, zinc, lead, silver, and other ores, is the best proof of its superiority. More than 90% of the filters in use for this work are of the Oliver type.

### MATERIALS HANDLED BY OLIVER FILTERS

Ammonium nitrate	Gluten	Potash from flue dust
Arsenate of iron	Gold ore slime	Potato starch
Barium carbonate	Graphite	Potassium bichromate
Blast furnace flue dust	Guncotton	Potassium carbonate
Borax	Gypsum	Saccharate lime—cold
Calcium carbonate	Iron concentrates	Saccharate lime—hot
Calcium carbonate	Iron flue dust	Silver ore slime
Calcium sulphate	Kaolin	Slaked carbide
Calcium tungstate	Kelp char	Sodium acetate
Calcium phosphate	Kelp or sea weed	Sodium benzene sulphionate
Calcium sulphite	Lampblack	Sodium chloride
Caliche	Lead arsenate	Sodium chromate
Carbox	Lead concentrate	Sodium hydrate
Caustic soda	Lime cake, first carbonation	Sodium nitrate
Cement copper	Lime sulphur mix.	Sodium permanganate
Cement dust	Lithopone	Sodium sulphate
Cement slurry	Lubricating oil	Sodium sulphide
China clay	Magnetic iron concentrate	Sodium hyposulphite
Citric acid	Maltose sludge	Starch
Clay, acid treated	Mineral paint	Strontium carbonate
Coal screenings	Molybdenite	Talc
Copper concentrate	Nitrate of soda	Tartaric acid
Corn starch	Norit	Tungsten slime
Cyanide slime	Ochre	Ulexite
Decolorizing carbons	Oils	Vanadium precipitate
Dinitrophenol	Paper pulp	White lead
Dyes	Phenol	Yeast products
Electrolytic zinc slimes	Phosphoric acid	Zinc concentrates
Glucose	Potash from alunite	Zinc oxide

*Continued on Next Page*

### USES IN CHEMICAL WORKS

In the chemical industry the Oliver finds a wide use in the manufacture of caustic alkalis, phenol, ammonium sulfate, bicarbonate of soda, nitrate of soda, phosphates, potash, paints, dyes, and many other chemical products. Its use has revolutionized filter practise by saving labor, increasing savings and cutting cost of production.

#### Causticizing

Is particularly adapted to dewatering and washing the mud produced in the causticizing process for the manufacture of caustic soda. The volume of liquor to be handled is greatly reduced, higher concentrations are maintained and more complete extraction of the caustic liquors effected.

#### Starch and Glucose

In starch plants the Oliver handles starch for producing dry starch and dewater starch for conversion into glucose; being successfully used for clarifying glucose liquors and for filtering gluten.

#### Sugar

A most successful use of the Oliver is for the filtration of Saccharate of Lime and First Carbonation Juice in Beet Sugar Factories. During the past four years more than 180 Olivers have been installed for this work. Using but one-third the amount of wash water required by other types, higher cake purities are obtained. Labor for operating and cloth consumption are only a small fraction of that necessary with other filters. In several instances first cost of installation has been repaid in one year by saving in filter cloth alone. Very successful for handling Carbrox, Norit and other decolorizing Carbons used in clarifying sugar juice, glucose, etc.

#### Wood Pulp

In the washing of paper pulp the recovery of black liquor is increased, uniformly clean sheets are produced, a clean liquor of uniform density is delivered to the evaporators, and evaporator load is decreased over 25%.

Over 100,000 tons of solids per day are being filtered on Olivers in all parts of the world, handling practically every product that can be filtered in plate and frame presses, or any other filter, at one-half to one-tenth the cost—and with higher recoveries. New uses are developed continuously by investigations in new fields.

### VACUUM PUMPS AND VACUUM RECEIVERS

Especially designed and constructed for use with Oliver Continuous Filters. Manufactured in our own factory. Highly efficient and recommended for any dry vacuum service. Built with displacements of 50, 75, 200, 400 and 800 cu. ft. per minute.

### COMPRESSORS

Our dry vacuum pumps can be used as low pressure compressors without change. Pressures from 20 to 50 lbs., depending upon size of compressor. Displacement 50, 75, 200, 400 and 800 cu. ft. per minute.

### CENTRIFUGAL PUMPS

Designed for Oliver Continuous Filter requirements to operate against high vacuums, but are excellent for any service to which centrifugal pumps are adapted. Made in cast iron, acid-proof bronze or special alloys. Sizes, 1½", 2", 2½", 3" and 4" in both belt and motor drive.



**DRY VACUUM PUMP DESIGNED ESPECIALLY FOR OLIVER SERVICE**

Recommended for use on dry vacuum systems requiring high efficiency

### ACID PUMPS

Specially constructed acid-proof 2" centrifugal pump for handling exceedingly corrosive solutions. Suitable for hydrochloric, dilute sulphuric, hydrofluoric, phosphoric acids or other corrosive acids or compounds.

### OLIVER-SHERWOOD CUTLESS BEARING

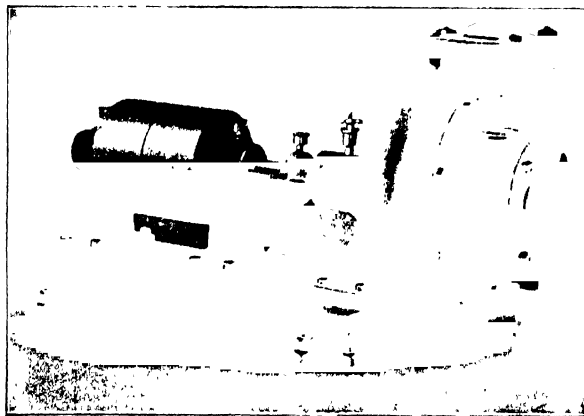
A bearing designed for conditions where water and grit cut the bearing and shaft. Adopted by leading pump manufacturers for bearings on vertical deep well pumps, and inner bearings on centrifugal sand pumps.

A bearing that will run in water and grit without any wear on bearing or shaft. No attention or lubrication required. Suitable for log washers, suction dredge shafting, step bearings in agitators, etc.

### OLIVER SERVICE

Three laboratories are maintained for the investigation of filtration problems. Tests are made free of charge. Send full particulars of your conditions and a 5-gallon sample of the thickened pulp to our nearest laboratory. Do not dry the sample before shipping, as filtering characteristics may be altered. We assist in planning filter installations and place our data and experience at your disposal. Our files contain a wealth of useful information on filtration problems that will aid in solving your difficulties.

**SEND FOR ILLUSTRATED CATALOG 12 D**



**OLIVER CENTRIFUGAL PUMP, BELT DRIVEN TYPE**

Also made for direct connection to motor drive

# THE OLDMAN BOILER WORKS, INC.

Manufacturers of Steel Tanks  
Boilers and Plate Work of Every Description  
Electric and Oxy-acetylene Welding

Main Office and Works  
BUFFALO, N. Y.

## PRODUCTS

Upright Boilers  
Tubular Boilers  
Marine Scotch Boilers  
Dry Back Boilers  
Oldman Patent Boilers  
Heating Boilers  
Steam Jacket Tanks  
Mixing Tanks  
Receiving Tanks  
Storage Tanks of any capacity  
Rendering Tanks  
Digesters and Dryers  
Special Designed Tanks  
Guyed and Self-supporting Stacks  
Smoke Flues  
Breechings  
Penstocks  
Blast Furnace Work

It will be to your advantage to consider our prices, deliveries and specifications when in the market for any of the above products.

An organization of thirty years' experience at your service.

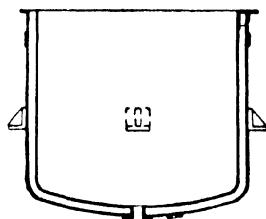
## SPECIAL STEEL PLATE CONSTRUCTION

We make a specialty of steel plate construction that is built to the customer's specification. In this connection we have built a large amount of chemical plant equipment, a few examples of which are shown below.

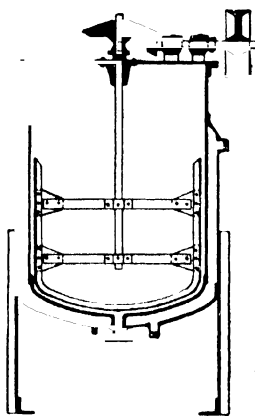
Our engineers having had wide experience in this field, we are often called upon to advise with prospective clients as to the best type of construction to fit certain conditions. This experience is at the service of those firms requiring complete engineering services for design, construction and erection of chemical equipment.

## WELDED STEEL PLATE EQUIPMENT

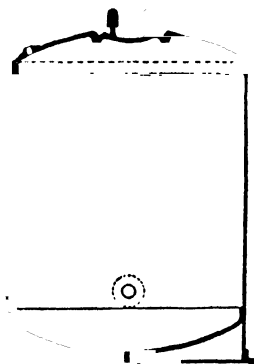
The superiority of welded steel equipment over the riveted for conditions where severe corrosion or high pressures exist, is being fully recognized to-day by operating engineers. Our shops are fully equipped to turn out welded apparatus of any size.



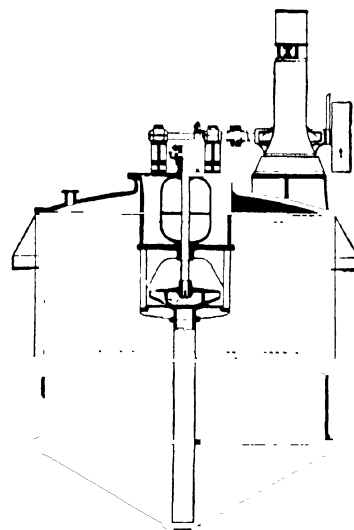
ELECTRIC WELDED  
STEAM JACKETED TANK



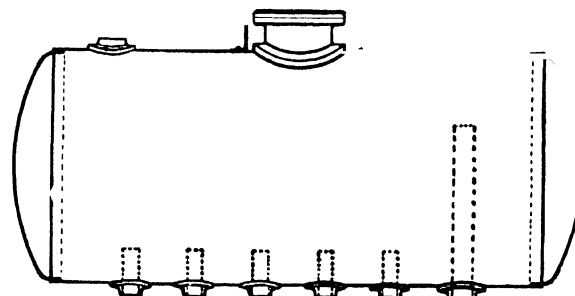
STEAM JACKETED  
MIXING TANK



RECEIVING TANK



ACID GENERATING TANK



HORIZONTAL RECEIVING TANK

# CHARLES ORDWAY

Successor to

THE YARYAN COMPANY

25 CHURCH STREET, NEW YORK, N. Y.

## PRODUCTS

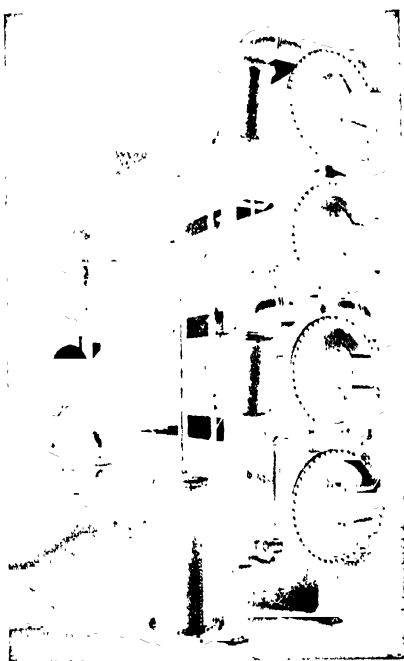
Evaporators, Single and Multiple Effect; Yaryan System Heater, Malone Block Liquor Filter.

## TYPES OF YARYAN EVAPORATORS

Yaryan Horizontal, Yaryan Vertical; Ordway-Yaryan Vertical, Ordway-Yaryan Horizontal, Ordway-Yaryan Box.

## THE YARYAN SYSTEM

Film evaporation is the distinguishing feature of the Yaryan System, which is accomplished by forcing a very small stream of liquor into a comparatively large steam-heated tube, this tube being one of several composing a continuous coil, thus blowing the entire mass of liquor into spray. The last tube of the coil has an outlet into a chamber that is under a less pressure than that on the feed end, resulting in an increasingly rapid flow of vapor-entrained liquor through the



THE ORDWAY-YARYAN VERTICAL TYPE

coil toward the separating chamber. The salient features obtained by this system are in addition to Film Evaporation, rapid motion of liquor over heating surface, great gain in absorption of heat by the liquor as its velocity increases, less liability of injury to the liquor, and of incrustation on the heating surface, the use of waste exhaust steam, or steam at high pressure.

**General Construction**—Condensers, Pumps and Piping are supplied, best adapted for the system.

**Heater**—The Yaryan System Heater is very successful in preheating liquors to be concentrated. It is a counter-current heater, utilizing the heat in the drip from the first effect.

**Catchalls**—Entrainment is the bugbear of evaporator manufacturers, especially in handling valuable or foamy liquors. Our catchalls prevent this.

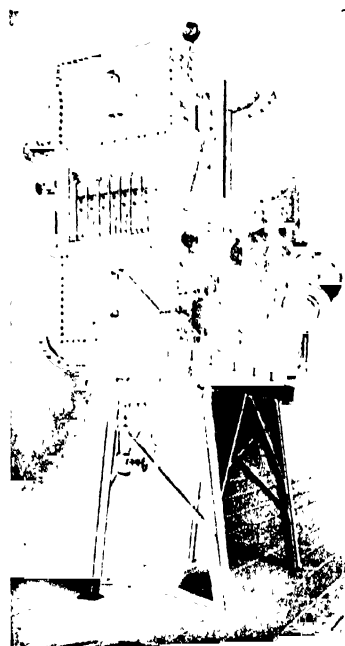
**Metal**—Yaryan evaporators can be built of any desired metal or alloy.

The Yaryan System permits of a double or triple effect in concentrating Pectin, Gelatin or other delicate liquids, without affecting color or flavor, thus affording great saving in steam and water over a single effect.

A Yaryan effect can be added to any existing evaporator installation resulting in a proportionate saving in steam and water.

Above all, this evaporator is successfully used in handling very foamy liquors, such as Soda Pulp Liquor, which is one of the most troublesome solutions known.

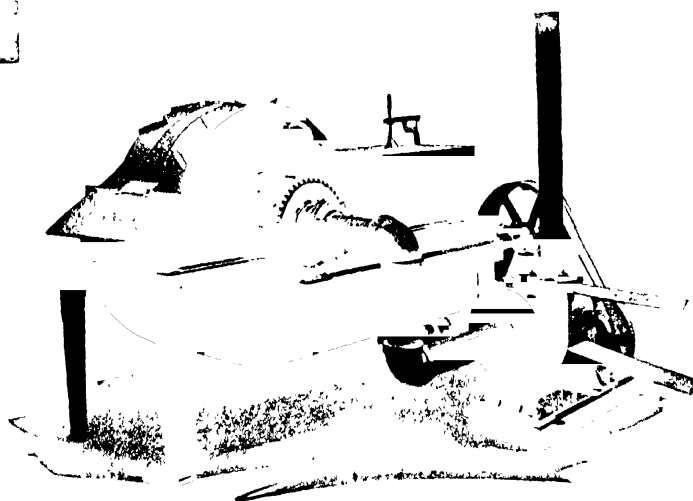
The construction permits of very high steam pressures, as well as low, being used.



THE ORDWAY-YARYAN BOX TYPE

## MALONE BLACK LIQUOR FILTER

This filter was designed and is in successful operation in many pulp and paper plants for the separation of pulp from the black liquor before evaporation. It is very economical because it saves the evaporator tubes from being coated with pulp, as well as recovering the latter.



MALONE BLACK LIQUOR FILTER

# TINIUS OLSEN TESTING MACHINE COMPANY

Manufacturers of Testing Machines, also  
Olsen-Carwen Static-Dynamic Balancing Machines

500 NORTH 12TH STREET, PHILADELPHIA, PA.

## PRODUCTS

Testing Machinery and Instruments for determining the Physical characteristics of all material. Universal Testing Machines, Special Testing Machines for Hardness, Torsion, Impact, Bending, and Alternate Stress Testing. Special Testing Machines for cement, concrete, fabric, cloth, twine, paper, rubber, leather, oils, grease, bearing metal, and ball or roller bearings. Also testing machines for molded insulating material, springs, wire, rope, chain, anchors, iron, steel, welds and welding material, road materials, etc. Special Efficiency Testing Machines for determining the property of all tools. Special Milling Machines, pumps, Viscosimeters, presses, accumulators, also various types and sizes of Olsen-Carwen Balancing Machines for balancing rotating parts.

## OLSEN CATALOGS

We build several hundred types and sizes of testing machines applying to almost every conceivable class of material and have classified these machines, according to their similarity and use in our catalog, by dividing it into eight (8) parts, and various Bulletins as follows:

- Part "A"—Universal Testing Machines and Instruments.
- Part "B"—Spring Testing Apparatus and Spring Machinery.
- Part "C"—Cement, Concrete and Road Materials Testing Machinery.
- Part "D"—Cloth, Yarn, Paper, Leather and Rubber Testing Machinery.
- Part "E"—Wire, Rope, Chain and Anchor Testing Machinery.
- Part "F"—Oil, Grease, and Bearing Metal Testing Machinery.
- Part "G"—Transverse and Beam Testing Machinery, Foundry Testing Machines.
- Part "H"—Special Testing Machinery, including Impact, Abrasion, Vibratory, Bending, Hardness, Endurance, Torsion, Alternate Stress, and Efficiency Testing Machines.
- Pamphlet—Olsen-Carwen Static-Dynamic Balancing Machines.
- Pamphlet—Theory of balancing and technical description of Olsen-Carwen Balancing Machines.

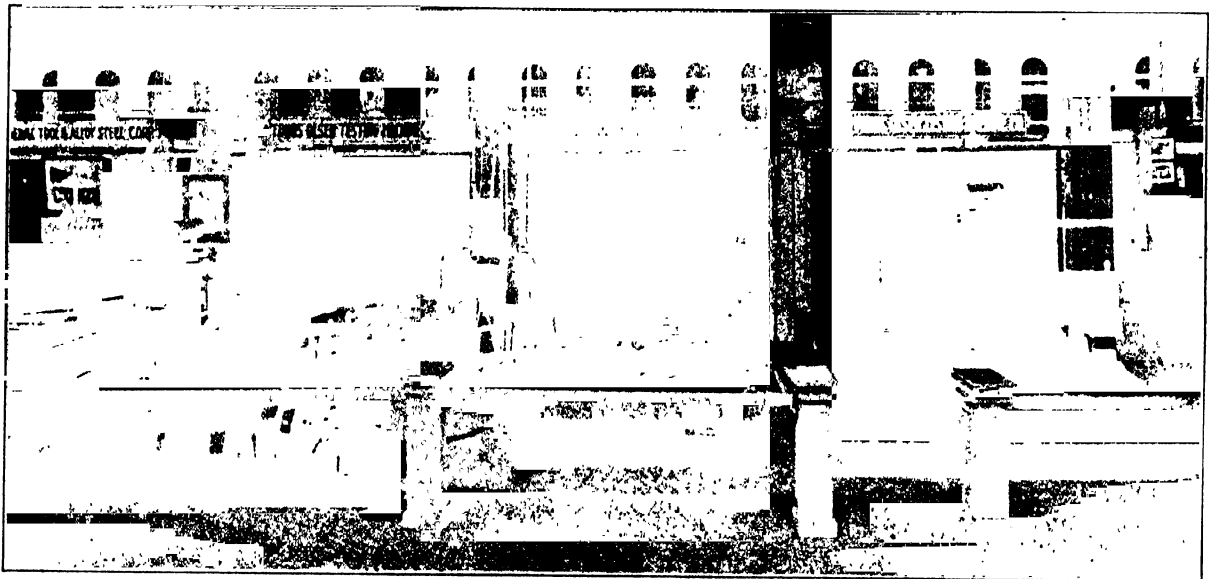


EXHIBIT OF OLSEN TESTING MACHINES, STEEL TREATERS' CONVENTION, PHILADELPHIA, PA., 1920

This exhibit illustrated all the very latest up-to-date testing machines used by Metallurgists and Steel Treaters throughout the country and abroad, and included the following:

- 100,000 lbs. capacity "Olsen" Latest Automatic and Autographic Universal Three screw Type Testing Machine
- 60,000 lbs. capacity "Olsen" Automatic and Autographic Torsion Testing Machine, No. 1.
- "Upton Lewis" Toughness and Endurance Testing Machine, No. 2
- "Olsen Foster" Alternate Torsion Testing Machine, No. 2
- "Olsen" Combined Impact Tension and Cantilever Type Impact Tester
- "Matsumura" Repeated Impact Tester
- "Olsen" Special Endurance Testing Machine
- "Olsen" Hydraulic Brinell Hardness Tester with Microscope and Depth Measuring Instrument
- "Olsen" Autographic Transverse Tester, No. 1.
- "Olsen" Ductility Testing Machine, No. 2.
- "Lewis Hayes" Extensometer.

*Continued on Next Page*



## TESTING LABORATORY, RESEARCH DEPARTMENT

Have a completely equipped Testing Laboratory and Research Department in which we are prepared to make all kinds of tests and investigations and develop new methods of testing and suitable machines for any purpose.

Special problems requiring the development of new methods of testing and new designs of testing machines are placed in the hands of expert Engineers who are trained in this class of work.

## GUARANTEE

All testing machines, as built or manufactured by us, are of the most improved design, built of the very best material, and of the highest grade of workmanship. They are thoroughly tested on completion, and satisfaction is guaranteed.

## OLSEN-CARWEN STATIC-DYNAMIC BALANCING MACHINES

In this age of high speed machinery it is essential for their successful and continued use that all rotating parts are in perfect balance.

The unbalance in any rotating part is either static or dynamic or both, and it is necessary to determine the exact amount of unbalance statically first, together with the plane or angle of unbalance. This static unbalance is then temporarily corrected on the machine, and the point along the length of the rotor or the particular crank of a crankshaft found at which such a static unbalance should be corrected to prevent the introduction of a dynamic couple.

If a dynamic unbalance is still present, this is then found as to amount and plane or angle and the entire correction for both static and dynamic unbalance made at one and the same time.

The feature of determining the point along the length of the rotor or the crank of the crankshaft at

which static unbalance should be corrected is of exceedingly great importance, as very often a rotor only has a static unbalance which, if corrected at the wrong point along its length, only introduces a dynamic unbalance, requiring more time and work to eliminate.

The Olsen-Carwen Balancing Machine will balance any rotating part perfectly with speed and economy, thereby placing the art of balancing on a production basis, so each and every crankshaft, fly-wheel, fan and driving shaft of an automobile or truck can readily be balanced, as well as every armature or rotor used in the electrical world.

Olsen-Carwen Static-Dynamic Balancing Machines are made horizontal, as shown, in many sizes, from that of balancing small armatures up to that of balancing the largest of rotors, also special machines for crankshaft balancing, or where a crankshaft has more than two (2) bearings, it is imperative to mount same in three (3) bearings, in the balancing machine for accurate results.

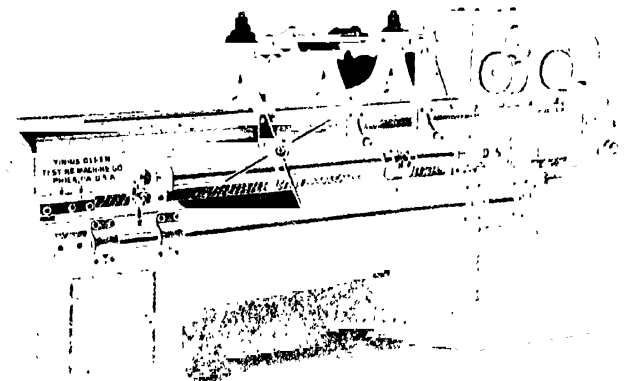
Olsen-Carwen Static-Dynamic Balancing Machines are made vertical for balancing separator bowls, etc., with the liquid contained in them, and also of various sizes.

## RESEARCH AND BALANCING DEPARTMENT

We maintain a complete Research and Testing Department with Balancing Machine equipment under the supervision of the very best expert balancing Engineers.

We are thus in a position to balance any rotating parts, crankshafts, rotors or complete engines and make recommendations to you as to design and construction, tending to eliminate vibration and also to design and build special balancing machine equipment based on principles used only in the Olsen-Carwen Balancing Machines and controlled by us.

**"Bulletin covering the theory and art of balancing on request"**



**OLSEN-CARWEN STATIC-DYNAMIC BALANCING MACHINE NO. 3**  
Patented in United States and all foreign countries, including South America, Japan, etc.

# GEORGE F. OTT COMPANY

Established 1870

Coppersmiths, Tankmakers, Machinists

207-213 BUTTONWOOD STREET, PHILADELPHIA, PA.

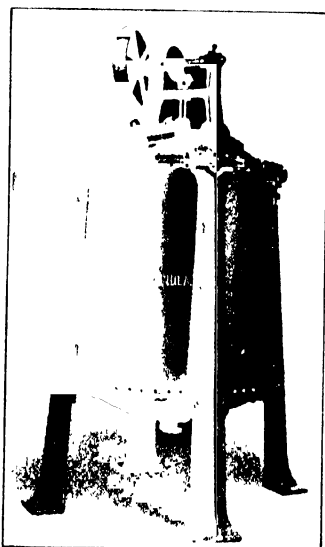
## PRODUCTS

Copper, Aluminum, Iron or Steel Equipment for Chemical Plants, Dye Extract Plants, Dye Houses, Tanneries, Breweries, Yeast Plants, Acetic Acid Plants, Including:

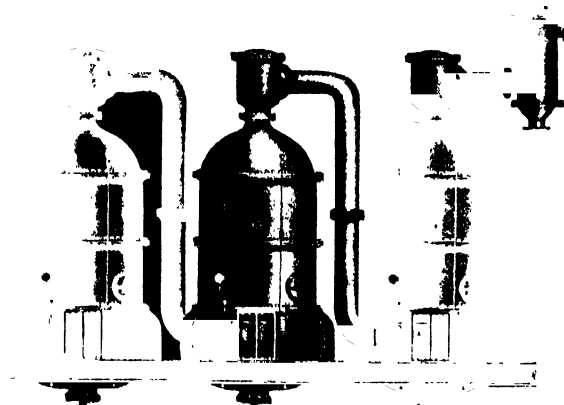
Autoclaves	Digesters	Pipe and Fittings
Candy Coating	Evaporators	Still
Pans	Extractors	Stirrers
Condensers	Heaters	Tanks
Coolers	Kettles	Vacuum Pans

## FACILITIES

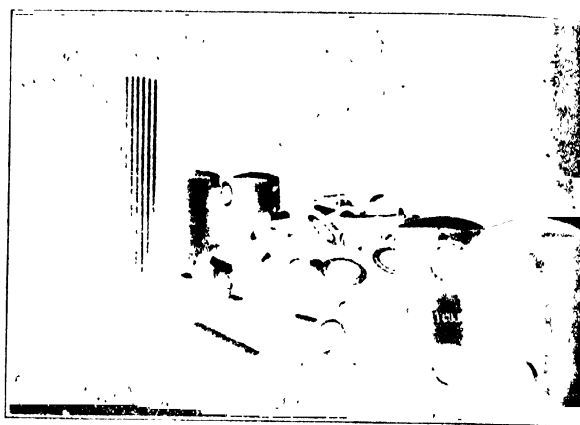
The fact that we operate, in connection with our coppersmith shop, a steel tank department and machine shop, enables us to build to advantage as regards price and delivery, apparatus comprising all three trades. It allows the assembly of complete apparatus, insuring proper fit of all parts prior to shipping.



COPPER STILL WITH HEATING COILS AND STIRRER



COPPER TRIPLE EFFECT EVAPORATOR

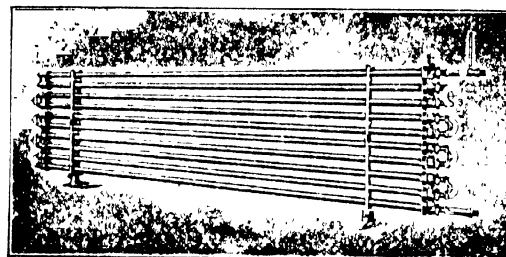


COPPER APPARATUS FOR SOAP-CANDLE AND FATTY ACIDS

## EXPERIENCE

To successfully carry out any design, accurate workmanship of its minutest detail is essential.

Our 50 years of experience coupled with our engineering facilities enables us to accomplish this, no matter how complicated the design.



COUNTER CURRENT TYPE DOUBLE PIPE COOLER OR HEAT EXCHANGER

Copper, Copper Lined or Aluminum Tubes, Fittings of any Metals for Heating or Cooling Liquids or Gases

## RECORDS AND DRAWINGS

All parts of plants installed by us are accurately tabulated, enabling us to supply any part on short notice.

## GUARANTEE

All materials and workmanship carry our guarantee.

## ESTIMATES

Upon receipt of rough sketch, drawings or specifications of requirements, we will cheerfully cooperate with you. Please send as much information as is available.



UPPER SIDE  
SLOTTED BRONZE STRAINER  
PLATES FOR ROUND OR  
SQUARE TANKS

# PACIFIC TANK & PIPE COMPANY

"The Standard Since 1888"

**Manufacturers - - Contractors**  
**Wood Tanks and Wood Stave Pipe**

**Main Office: 308 Market St., SAN FRANCISCO, CALIF.**

NEW YORK, N. Y.: 506 St. Paul Building  
 PHILADELPHIA, PA.: 419 Liberty Building

LOS ANGELES, CAL.: 905 Trust and Savings Building  
 SALT LAKE CITY, UTAH: 327 Newhouse Building  
 CHICAGO: 171 West Washington Street

## PRODUCTS:

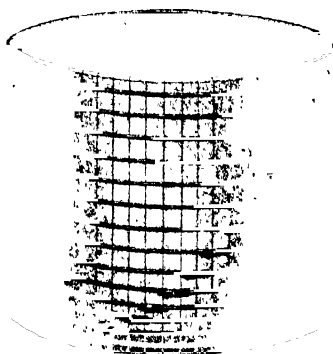
Round, Half Round Oval, and Rectangular Tanks of all capacities, made from California Redwood and Douglas Fir.

Wood and Steel Towers for elevated tanks.

Machine Banded, Continuous Stave, Bored Pipe, and Steam Pipe Casing.

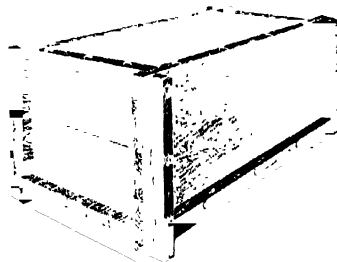
## TANKS:

Round tanks of all sizes, fitted with round hoops and malleable iron straight pull lugs - the best container obtainable for chemical solutions.

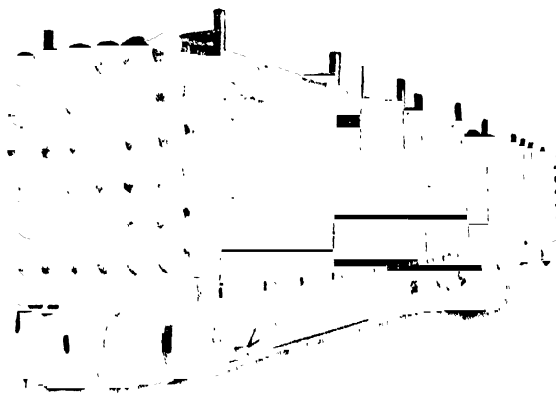


ROUND TANK

Rectangular tanks made to fit unusual requirements. All exposed metal parts on top and inside of tank protected. Made with or without center partitions.



RECTANGULAR TANK



TWO CARS OF PIPE FOR SHIPMENT

## PIPE:

Machine Banded Wood Stave Pipe in sizes from 2" to 30". Wound with copper wire for corrosive solutions. Bored Redwood log for acid and brine. Wood covering for steam pipes.

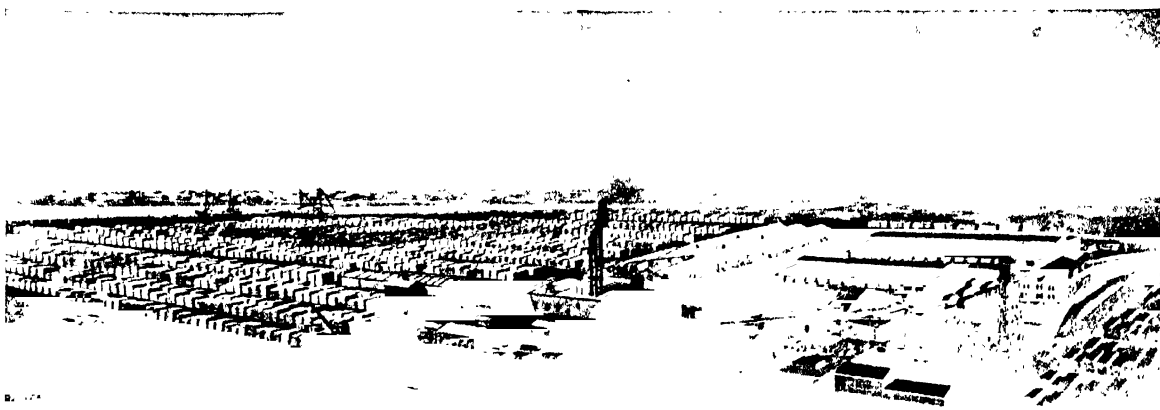
Continuous Stave Pipe for sizes 24" diameter and larger. Suitable for water works systems, mills, and manufacturing plants.



LENGTH OF MACHINE BANDED PIPE

## CATALOG:

We will be pleased to furnish our catalog on Tanks, Machine Banded and Continuous Stave Pipe on request.



THE PLANT BEHIND THE GOODS

# THE PACIFIC LUMBER COMPANY

(OF ILLINOIS)

Midwestern and Eastern Distributors of California Redwood

2009 McCormick Building

CHICAGO, ILL.

New York, N. Y., 500 Fifth Avenue

Kansas City, Mo., Grand Avenue Temple Building

## THE PACIFIC LUMBER COMPANY

Manufacturers and Pacific Coast Distributors

GENERAL OFFICES 311 California Street San Francisco, Cal.

BRANCH OFFICE Central Building, Sixth and Main Streets Los Angeles

EXPORT COMPANY A. F. Thane &amp; Company

San Francisco, Cal. 311 California Street

MILLS Scotia, Humboldt County, Cal.

New York, N. Y., 233 Broadway

### Manufacturers of Redwood Lumber for Tanks, Vats, Pipe, Etc.

#### PRODUCT

**California Redwood**—a non-resinous, soft wood, permeated during growth with an odorless "natural" preservative. Resists acid action, rot and fire.

#### DISTINCTIVE CHARACTERISTICS OF REDWOOD

Redwood is highly valuable for chemical manufacturing processes because it is unusually resistant to decay, rot and fire, and because of its insulating qualities. Until recent years little was known of the extraordinary values of Redwood as a specialty wood, but as Redwood is becoming better understood by industry its users are increasing continually. Moreover, production and transportation facilities are now available to supply the large demands of the future.

#### USES

Tanks and Vats  
Pipe and Flume  
Insulation for all Refrigerating Purposes  
Cooling Towers  
Factory Doors  
Fire Doors  
Fire Walls

#### REDWOOD TANKS AND VATS

Redwood makes a superior stave for tanks.

Redwood is a non-conductor of heat and cold; 2 in. of Redwood is equivalent in insulating power to approximately 30 in. of steel or concrete. This is an element of high importance in the stave for this use because it preserves the temperature of the contents of the tank.

Redwood staves are made from clear heart straight-grain stock, and come in standard sets of 6 to 9 ft. and 10 to 20 ft. in length.

Redwood's long life and its resistance to decay or corrosive acids and alkalis make it extremely valuable for tanks. Redwood tanks can handle muriatic acid solutions up to 6%, and up to 28% of nitrohydrochloric acid.

Redwood tanks are used in metal mines, where strong solutions of destructive acids are necessary in refining processes; in chemical works, tanneries, breweries, soap factories and other manufacturing processes where the tank is called upon not only to stand up under years of service, but remain unaffected by the contents. There are thousands of Redwood tanks in use for water storage, in wineries, for oil, fire protection, railroads, etc.

Redwood tanks will resist fire, are not injured or affected by arid climates or extremes of temperature. Redwood wears evenly under all sorts of service.

Redwood is particularly adapted to all kinds of tanks, and is used for water tanks, cyanide plant, and acid tanks. Following are eight good reasons for using Redwood Tanks.

1. They are preserved by water and not rusted or corroded by it.
2. They are not corroded by sulphur or mineral water and fumes.
3. They are not destroyed by reasonably strong solutions of acids or salts.
4. It requires less labor and expense to erect them than metal tanks.
5. They are cheaper than steel or galvanized iron tanks.
6. Their durability exceeds either steel or galvanized iron.
7. They keep water cooler in summer and warmer in winter.
8. They are easily taken down and reassembled at another point, which is not practical in the case of metal tanks.

#### TESTS OF TIME AND SERVICE

In a large manufacturing plant in New York State, where they refine oil from fats, there are two 3-inch Redwood tanks, one of which was filled with muriatic acid and kept at a temperature of 180° day and night for a period of seven weeks. The same acid remained in the tank three weeks longer, then 9,000 gallons were drawn off, the other 3,000 gallons remaining in the tank indefinitely. Previous to using this tank for acid, it was used for hot water storage. This is about as severe a test as could be put on any wooden tank.

In another large manufacturing plant, a number of 2-inch Redwood tanks have been in continual use since 1907, performing the function of storing fats. At this time these tanks are still giving good service.

In a large tanning factory there are still in use Redwood vats which were installed sixty years ago and which have given continual service since that time. Their present condition is evidence that they will continue to give satisfactory service for an indefinite period.

One of the large metal mining companies states that it is using Redwood tanks both for acid and saline solutions, with the very best results. These tanks are used in a leaching process where the steel hoops must be covered with lead to protect them against the strong solutions.

#### MACHINE BANDED REDWOOD PIPE

This pipe is made in completed sections, and is shipped, ready to be laid.

The pipe sections are of standard lengths, from 6

*Continued on Next Page*

24 feet. Diameters are from 2 inches to

staves are made of carefully selected, well seasoned Redwood, and milled to the circular outline of the tree, both inside and outside. They are then assembled and wound with heavy galvanized pipe winding under heavy tension, the sizes varying according to the pressure.

Having Redwood machine-banded pipe the sections are simply driven together with a maul or ram.

#### USES FOR REDWOOD PIPE

- Mines, where drainage water is not only hot, but carries mineral and chemical solutions, which are essential to other kinds of wood, or to metal.
- Conveying water for mining water supply.
- Conveying water for fire protection systems.
- Irrigation and conveying water on farms.
- Conveying mineral and acid water in chemical plants.

#### COMPARATIVE ADVANTAGES OF REDWOOD PIPE

• Costs less for material, transportation and installation.

• No expansion joints required, as Redwood will not expand nor contract with heat or cold.

• Will survive many replacements of metal bands or wire hoops, even though they are heavily galvanized or asphaltic coated.

• No "temperature cracks" as in cement or concrete pipe.

• Will not freeze under a temperature that will burst metal pipe. If water freezes the flexibility of Redwood will prevent bursting.

• No accumulation of blisters or foreign substances to impede flow of water.

• Lasts longer than any other pipe except iron.

• Not attacked by worms or insect life,—not even by the notorious white ant of tropical countries.

• Unusual resistance to acids and alkalis in water or earth.

• Water will remain cool, even when pipe is exposed to sun's rays, on account of the non-conductivity of wood.

• No discoloration of water contents.

• No "tainted taste" to water contents.

#### INSULATING QUALITIES OF REDWOOD IDEAL FOR REQUIREMENTS OF COLD STORAGE PLANTS

Redwood cellular structure when studied under a microscope, looks very similar to a comb of honey between the dark annular rings. Every one of these millions of cells in the growing tree is full of sap, but when the tree is cut into lumber, the lumber must be "seasoned" or dried, before it goes into commercial use. This "seasoning" process consists merely of evaporating the natural moisture of these cells. Each cell, therefore, becomes a dead air space.

The cellular make-up of Redwood is uniform both in the thickness of the cell wall as well as the size of the cell. It is plainly evident, therefore, that heat applied to one side of a piece of Redwood, to travel through the Redwood must pass through a thin cell wall and then another dead air space, and so on. Heat passing through this combination rapidly dissipates.

Prof. L. J. Towne, of Columbia University, gives the relative power of conduction of 1 to 20 between wood and stone, cement or clay products. This means that stone and cement are 20 times a better medium for the conduction of heat or cold than is wood. The

millions of dead air cells between the annular rings of Redwood are what give Redwood its insulating power.

#### INSTALLATIONS OF REDWOOD INSULATION IN COLD STORAGE PLANTS

Manufacturing plants use Redwood as a substitute for corkboard for insulating.

There are some splendid examples of Redwood's insulating power, as well as its remarkable longevity under the most severe service in the old plant of the National Ice & Cold Storage Co., San Francisco. This plant was built in 1902 and Redwood was used throughout. The system of brine casing is incased in Redwood boxes made of 1 in. matched and surfaced Redwood. Nearly all of these insulation boxes are still in use. The temperature in the brine pipes is 6° above zero, and they have gradually built up around the pipe, inside of the box, an incrustation of frost that completely fills the box. In spite of the fact that the temperature of the inside of these insulation boxes is 6° above zero, and the temperature in the engine room of the plant is 80°, there is no shrink, warp, swell, twist nor check in these boxes, nor is there any gathering of frost on the outside of the box which would indicate free conductivity through the wood.

Not only this plant, but most of the icehouses on the Pacific Coast use Redwood as lining for cold storage and ice rooms. In the plant above referred to there are ice storage rooms that have been in continuous use for 15 years, and where Redwood has been incased with frost and ice for that period, and in spite of this severe service these rooms are thoroughly airtight—the joints of the wood are tight.

#### REDWOOD FOR ROOFS

Redwood possesses a number of qualities that make it highly preferable for roofs, and particularly in factories where there is humidity and condensation to contend with. It has been found particularly serviceable in connection with the so-called "sawtooth" type of roof.

In many kinds of business such as textile mills, paper mills, etc., where there is humidity or rising steam, there is trouble with condensation that drops back on to the products handled, and creates a manufacturing loss. This is due to the fact that the roofing materials do not properly insulate the sharp differences in temperature between the exterior and interior, and particularly where there is severe cold weather.

It is not necessary to subject Redwood to artificial preservatives to protect it from rot and decay—it possesses a **natural** preservative that resists rot both in contact with water, moisture or humidity, or subjected to variable conditions of heat or dryness, or severe alternating dry and moist conditions. Redwood can be denied ventilation by sealing in metal, and under conditions of this kind it has a high resistance to dry rot; this same resistance to dry rot is present even if the wood is not denied air.

#### MILLS, FACILITIES AND CAPACITY

The Pacific Lumber Company is the largest manufacturer and distributor of Redwood lumber. Our annual production capacity is now over 125,000,000 ft. of Redwood.

All of our offices are prepared to consult with any lumber user concerning his needs, and to advise as to the suitability of Redwood and its economical use.

If interested in the adaptability of Redwood for your requirements, we shall be glad to give full information and advice without obligation on your part.

# PACKARDS & JAMES FISON (THETFORD) LIMITED

Mills-Packard Patented Water-Cooled Sulphuric Acid Chambers

IPSWICH, ENGLAND

AGENT FOR THE UNITED STATES

ANDREW M. FAIRLIE

CITIZENS & SOUTHERN BANK BUILDING, ATLANTA, GA

## PRODUCTS

Complete plants for the manufacture of sulphuric acid, using the Mills-Packard patented chambers.

Mills-Packard patented water-cooled sulphuric acid chambers, applied to existing plants.

## MILLS-PACKARD SULPHURIC ACID CHAMBERS

The first Mills-Packard chamber was built in England in the year 1914. The merits claimed for this type of acid chamber are now fully established.

More than one hundred Mills-Packard chambers (distributed among twenty-seven different plants) are now operating or are under construction in England, France, Italy, and New Zealand.

These chambers are built in the shape of the frustum of a cone, and are water-cooled on the outside, and are provided with special devices for distributing the cooling water over the lead surfaces.

The advantages of these chambers are

1. The chamber space required per unit of sulphur burned is reduced to from one-half to one-third the usual space.

2. A very material saving in first cost of plant, per unit of capacity for making acid.

3. A substantial saving in ground-space, per unit of production capacity.

4. Longer life of the lead chambers.

5. No building is required for housing the chambers.

6. Nitric consumption, per unit of sulphur made into acid, is no higher than with the ordinary type of chamber.

7. Feasibility of combining one or more Mills-Packard chambers with the rectangular chambers of existing plants, or with tower systems, to increase production capacity at small construction cost.

## ACTUAL OPERATING RESULTS

Chamber space required: 3.5 to 4.5 cu. ft. per pound of sulphur burned per 24 hours.

Nitric consumption: 3.0 to 4.0 per cent, based on sulphur burned.

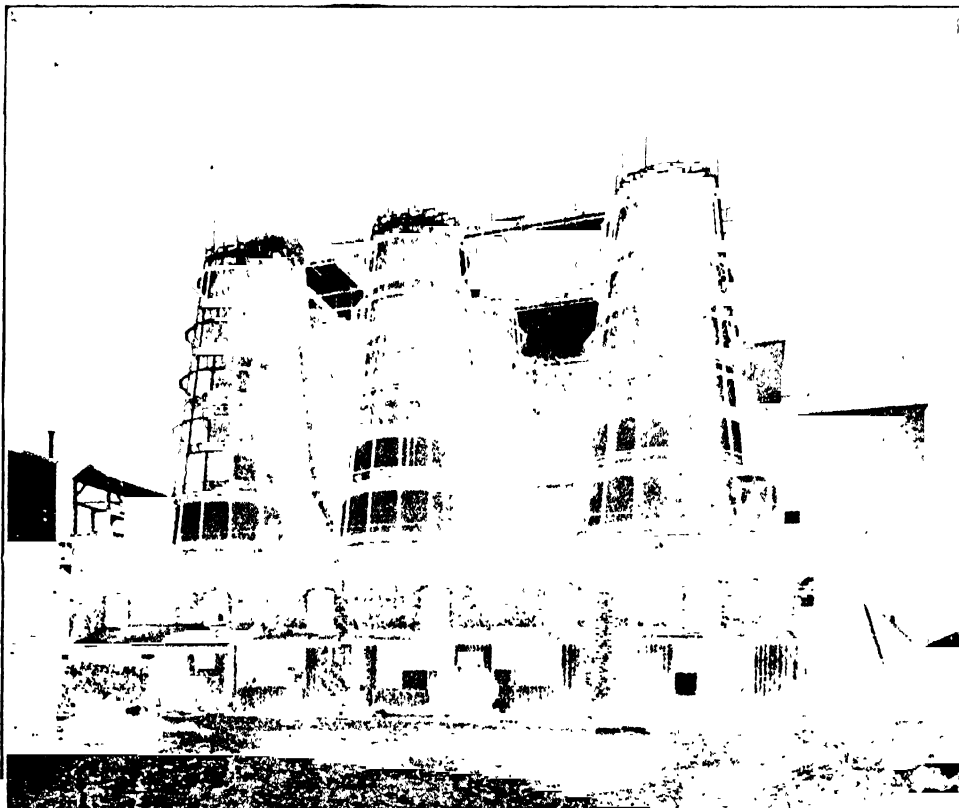
Cooling water required: 250 gallons per chamber per hour for the small chambers (7,330 cu. ft. each); 750 gallons per chamber per hour for the large chambers (11,890 cu. ft. each).

## SERVICES

The authorized agent for the United States is prepared to design and erect complete sulphuric acid plants, incorporating the Mills-Packard patented chambers, or to erect Mills-Packard chambers as an adjunct to existing plant, and to issue licenses for their use.

Inquiries from American manufacturers invited. References to operators of the Mills-Packard chambers furnished on request by

ANDREW M. FAIRLIE, Chemical Engineer,  
Citizens & Southern Bank Building, Atlanta, Ga



INSTALLATION OF NINE MILLS-PACKARD PATENTED WATER-COOLED SULPHURIC ACID CHAMBERS

# PALO COMPANY

153-157 WEST 23RD STREET, NEW YORK, N. Y.

SOLE AGENTS FOR

G. Meker & Co, Paris

L. Durieux & Co Paris

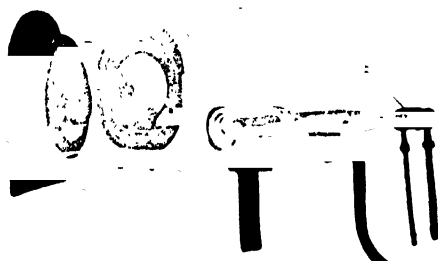
Hess Ives Tint Photometer

Goetz Polariscopes

## PRODUCTS

Apparatus for Laboratory and Industrial Use.

### MEKER BURNERS AND FURNACES

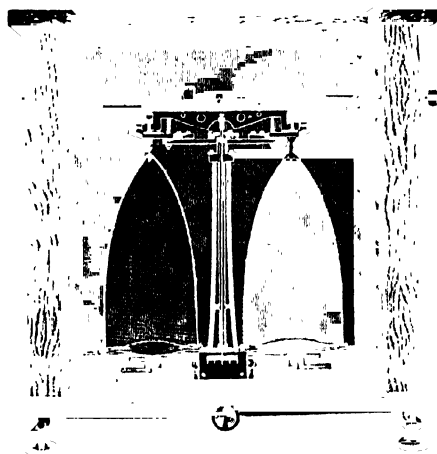


MEKER FURNACE

The enviable reputation of genuine imported Meker products enables us to unhesitatingly recommend Meker burners and furnaces for both laboratory and industrial purposes. Meker muffle furnaces attain temperatures ranging from 750°C. to 1650°C., whereas the crucible furnace produces temperatures in the crucible from 1050°C. to 1750°C.

Write for Descriptive Catalog.

### IDEAL ANALYTICAL BALANCE

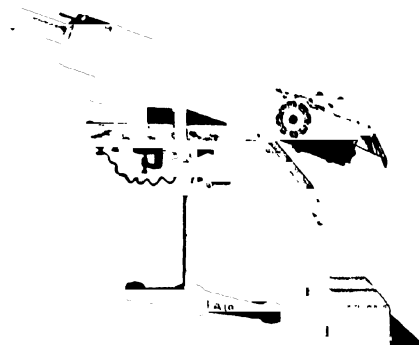


IDEAL ANALYTICAL BALANCE

This balance has a capacity of 200 grams and is sensitive to 1/10 of a milligram. The beams, stirrups, and pans are released in one operation.

Complete with set of weights, \$57.00. Complete information on this and other balances sent on request.

### HESS-IVES TINT PHOTOMETER



HESS-IVES TINT PHOTOMETER

The Hess-Ives tint photometer is for measuring and matching colors. It is based on entirely scientific principles and accurately measures color values of both liquids and solids numerically. This measurement is a definite determination of the amount of each of the primary colors and of black and white which enters into the composition of the color to be measured.

The photometer is recommended for use with:

Celluloid	Oils
Chemicals	Oil Cloth
Clays	Paint
Dental Products	Paper
Dyes	Pigments
Flour	Rubber
Glass	Silk
Glue	Soap
Ink	Sugar
Lacquer	Syrup
Lard	Textiles
	Varnish, Etc.

Complete description will be sent on request.

### DURIEUX FILTER PAPER



There is a grade of this paper to meet every requirement both in the laboratory and the plant. We are prepared to give you assistance in selecting the most efficient and economical quality.

Price list and samples sent on request.

### CATALOG

We are headquarters for Refractometers (all kinds), Spectroscopes, Water Stills, Polariscopes and Accessories, Calorimeters, Microscopes, etc.

Our general catalog will be sent on request.

# PARKS-CRAMER COMPANY

Piping Engineers and Contractors

1102 OLD SOUTH BUILDING, BOSTON, 9, MASS., U. S. A

Fitchburg, Mass.

Charlotte, N. C.

## PRODUCTS

Merrill Process High Temperature Industrial Heating Equipment

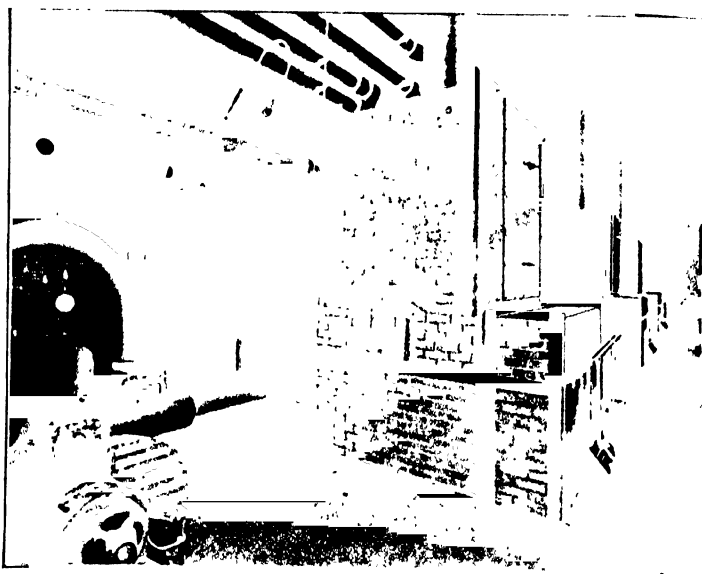
Humidifying and Air Conditioning Equipment

Industrial Piping

## MERRILL PROCESS OF INDUSTRIAL HEATING BY OIL CIRCULATION

In the Merrill Process of Industrial Heating a specially selected mineral oil is used as a medium for transmitting heat. This fluid is mechanically circulated at a high velocity by means of a Positive Rotary Pump through a specially designed Absorber or Oil Heater, thence through supply mains to the Apparatus to be heated, which apparatus may consist of Jacketed Kettles, Tanks or Pipe Coils through which a continuous flow may be maintained. From this apparatus the oil is forced back through return mains to the pump which keeps it in continual circulation. An expansion Tank is provided to take care of the increased volume of the oil as its temperature rises. The only pressure on the system, outside of the static head, is that necessary to overcome friction and will not usually exceed fifteen pounds at the Apparatus heated.

When the system is in operation the Circulating Oil is going through a continuous cycle of cooling and re-heating. At the point where the heat is utilized the



THREE ABSORBERS SUPPLYING HEAT TO FOURTEEN JACKETED KETTLES IN A LARGE CHEMICAL MANUFACTURING PLANT

temperature of the Circulating Oil drops as it passes through the Jacketed Vessel, Pipe Coil or whatever the apparatus may be. In the Absorber the Circulating Oil is reheated to the same temperature as before and is therefore ready to repeat the cycle.

This heating medium may be circulated at a temperature as high as 600°F. (316°C.) without any change in its physical or chemical characteristics, consequently this system makes an ideal method of heating where materials have to be raised to temperatures ranging from 300°F. (149°C.) to 550°F. (288°C.), allowing ample temperature difference for a rapid rate of heat transfer.

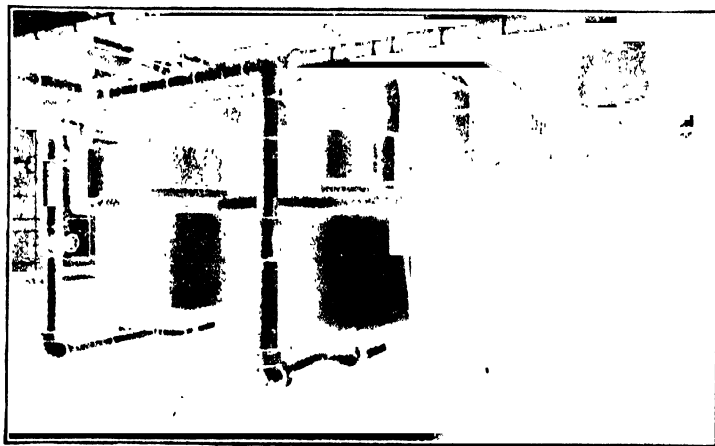
This system fills the most exacting requirements for temperature regulation and control, a feature of great importance in the Chemical Industry.

As the Absorber or Oil Heater, which is the only point in the system at which there is any flame or incandescent surface, may be located at any reasonable distance from the apparatus heated, the fire hazard may be reduced to a minimum.

As the furnace design may be arranged to suit the kind of fuel used, a comparatively high furnace efficiency may be maintained in utilizing the heat energy in the fuel.

This equipment is made up in standard size units and complete estimates will be furnished on request.

Send for descriptive booklet.



SIX GLASS LINED JACKETED TANKS HEATED BY A MERRILL PROCESS SYSTEM WITH OIL CIRCULATION



# PENNSYLVANIA CRUSHER CO.

New York



Pittsburgh

STEPHEN GIRARD BUILDING, PHILADELPHIA

## PRODUCTS

### "Pennsylvania"

- Single Roll Crushers
- Hammer Crushers
- Bradford Coal Breakers and Cleaners
- Double Roll Crushers
- Grinding Pans, Wet and Dry Types
- Twin and Rotary Crushers
- Feeders and Chutes
- Special Crushing Machinery

## SERVICE

The measure of value in crushing machinery is service, which in turn predicates a simple, sturdy design, gained by experience, and intelligent observation. "Pennsylvania" equipment is built on these ideals for dependable, efficient service rather than low first cost.

### "PENNSYLVANIA" SINGLE ROLL CRUSHERS



CROSS SECTION "PENNSYLVANIA" SINGLE ROLL CRUSHER, SHOWING CONSTRUCTION AND METHOD OF OPERATION. (PATENTS PENDING)

"Pennsylvania" Single Roll Crushers, in three distinct series, have been specialized for preparing bituminous coal for stokers—Bulletins 1001 and 501A—Primary and secondary crushing of cement rock, limestone, gypsum and similar materials—Bulletin 1002—Crushing burnt lime, caustic soda, clay, phosphate rock, soft ores and various chemicals—Bulletin 1003.

Each type in dimensions and weight is liberally proportioned for its service.

Capacities range from 10 to 450 tons per hour.

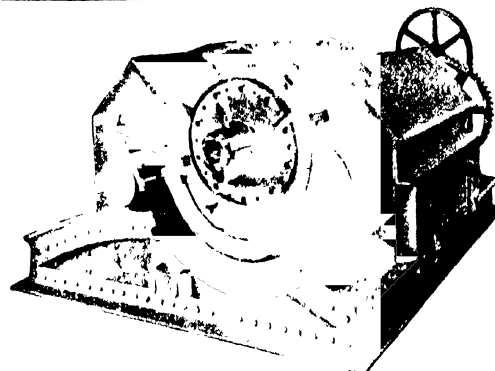
**Operation**—In operation the material entering the Crusher from grab bucket, track hopper or feeder, is drawn between the toothed roll and the breaker plate, where through an extended zone of crushing action, it is reduced with relative uniformity to the desired size in one operation, with minimum fines, slabs and oversize.

**Design** The massive frame, heavily ribbed and reinforced with steel tie rods, carries a heavy crushing roll and an adjustably hung spring-controlled Breaker Plate. A steel shear pin device provides double tramp iron protection.

### "PENNSYLVANIA" HAMMER CRUSHERS AND PULVERIZERS

"Pennsylvania" Hammer Crusher and Pulverizers are built in several series, each specialized for a distinct service, as follows:—

**"Thor" Type**—11 sizes for fine crushing of chemicals, ores, linters, cement rock, burnt lime and agricultural limestone. Bulletin 1010.



PHANTOM DRAWING SHOWING CONSTRUCTION AND FUNCTIONING OF "PENNSYLVANIA" HAMMER CRUSHER

**"Super" Type**—4 sizes, for primary heavy duty crushing on cement rock, limestone, gypsum, the softer ores, and similar materials. Bulletin 1005.

**"SX" Type**—15 sizes, for the fine crushing of bituminous coal in By-Product, and Beehive Coke Plants and Coal Washeries. Bulletin 1004.

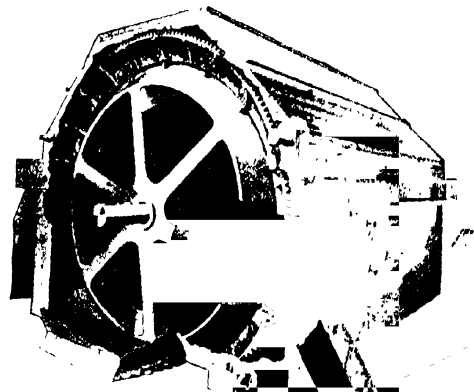
**"W" Type**—4 sizes, for crushing Anthracite Bore Hole Debris and similar service. Bulletin 1012.

"Pennsylvania" Hammer Crushers have powerful fabricated steel frames, heavy all-steel rotors and massive specially designed bearings.

The "Pennsylvania" non-magnetic Tramp Iron Separator is optional equipment with all types.

Capacities range from 5 to 400 tons per hour.

### "PENNSYLVANIA" BRADFORD COAL BREAKERS AND CLEANERS



DRAWING SHOWING CONSTRUCTION, CRUSHING AND CLEANING ACTION OF "PENNSYLVANIA" BRADFORD COAL BREAKER AND CLEANER

"Pennsylvania" Bradford Coal Breakers and Cleaners are used in By-Product Coke Plants, Mines, Coal Washeries and Central Stations for the preliminary crushing and automatic cleaning of bituminous coal.

The cost of crushing is lower per ton than with any other form of crusher, with the added advantage that a large percentage of the harder refuse is automatically rejected. The construction and uses are described in Bulletins 1006, 1006A, 1006B, 1006C, 1006D.

# THE PATTERSON FOUNDRY & MACHINE CO.

## Builders of Chemical Machinery

### EAST LIVERPOOL, OHIO

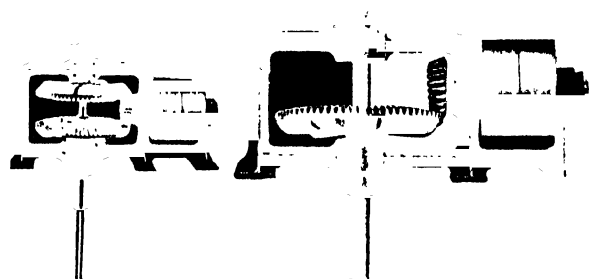
#### PRODUCTS

Agitators and Stirrers  
 Ball, Pebble and Tube Mills  
 Crushers, Disintegrators and Grinding Pans  
 Dry, Liquid and Paste Mixers  
 Evaporating Pans  
 Filter Presses  
 Pumps  
 Screens and Sifters  
 Special Chemical Machinery  
 Tanks of Wood or Steel  
 Wire Cloth

#### AGITATORS

Patterson agitators on account of their adaptability to any kind of tank, kettle, cistern, vat, barrel, stone-ware jar, or other container fill a long felt want. Because they are a stock machine, obtainable in quantity and in a number of designs and sizes, either from stock or on short notice, they have become an accepted standard in many industries.

Extensively used by chemical, aniline dye, paint and varnish, cement, ink, glue, grape juice, fruit juice and food manufacturers; sugar refiners; clay and earthenware plants, cloth printing plants; powder, steel, textile and rope mills, in fact in any plant where liquids and pastes are mixed or stirred.

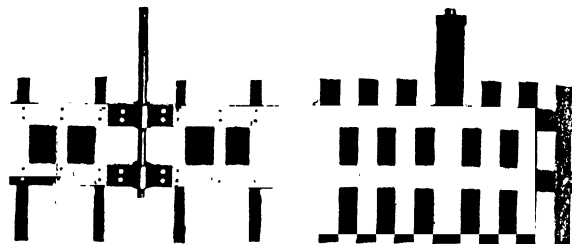


**DUPLEX AGITATOR**  
 Stirrers revolve in opposite directions. Built in same size as single agitator.

**SINGLE AGITATOR**  
 Built in three sizes.  
 Regular for tanks from four feet diameter to 12 feet in diameter.  
 Miniature for tanks from 3 feet to 4 feet diameter.  
 Midget for tanks 2 feet diameter and smaller.



**STYLE "A" STIRRER**  
 Two 6" x 1/4" bars of open hearth steel. Also furnished ("A-1") cast iron blades.



**STYLE "B" STIRRER**  
 Two sets of 2" x 4" oak cross arms bolted to cast iron arms set screwed to shaft. Six 2" x 4" oak teeth bolted to cross arms.

**ACIDPROOF STIRRER**  
 Steel shaft encased in 6" square oak shaft. 2" x 4" oak arms bolted through oak shaft. Teeth (2" x 4") dowelled to arms. Wood other than oak supplied when ordered.



**TYPE "E" MIXER**

#### MIXERS

**Type E**—These mixers are substantially built throughout. Made in both plain and jacketed types. Regularly furnished with tight steel tank, but can be supplied of acidproof construction with wood tank and stirrer, also cast iron tank and stirrer when desired.

#### DATA

No.	Diam. of Tank	Depth of Tank	Capacity Gallons	Thickness of Tank	Size of Shaft	Size of Pulleys	Weight lbs.	
							Plain	Jacketed
0	15 in	15 in	11	20 Gal	3/4 in	4x1 1/2 plain	50 lbs	
1	24 in	24 in	47	16 Gal	1 in	6x2 T&L	150 lbs	650 lbs
2	36 in	36 in	155	1 1/8 in	1 1/2 in	8x3 1/2 T&L	650 lbs	1250 lbs
3	48 in	48 in	375	3 1/8 in	2 1/2 in	14x5 T&L	1450 lbs	2500 lbs
4	60 in	60 in	734	1 1/4 in	2 1/2 in	14x5 T&L	2100 lbs	4200 lbs
5	72 in	72 in	1280	1 1/4 in	2 1/2 in	14x5 T&L	2450 lbs	5700 lbs

The Nos "0" and "1" Mixers have cast iron stirrers while the larger sizes are fitted with steel stirrers. A suitable draw-off cock is supplied on all mixers for drawing off the contents. Tight and loose pulleys are supplied on all except the No "0".

Patterson Mixers are also built in jacketed type suitable for 100 lbs steam pressure.

**Shellac Mixer**—The Patterson Shellac Mixer or Cutter is so designed that the shellac is thoroughly cut or mixed in a minimum length of time and with the least evaporation of the solvent.

This mixer consists of a well seasoned oak tank 3 ft. by 3 ft. with 2 in staves, with 4 substantial hoops. Equipped with a Patterson agitator with bronze vertical shaft with bronze hub on lower end to which is fastened the oak stirrer arms. A bronze gate valve is provided to draw off contents.

**Uses**—Patterson Mixers are extensively used for mixing:

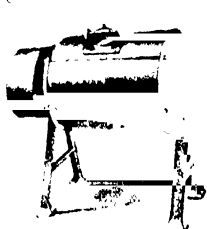
Varnish	Inks	Earth	Syrups
Shellac	Clay	Minerals	Soap
Glue	Oils	Greases	Colors
Mucilage	Dyes	Chemicals	Juices
Paste	Drugs	Candies	Lubricants

and many other mixed compounds not listed.

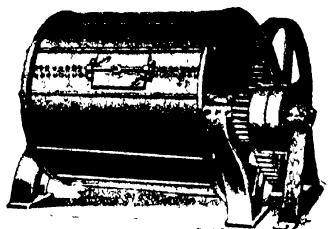
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# PEBBLE AND TUBE MILLS

These mills are of great weight and strength. Where heavy strains are to be overcome, charcoal, iron or castings are used and the design is such as to give the maximum efficiency with minimum operating cost and cost of repairs.



**TYPE "E" PEBBLE MILL**  
Complete with stands  
This type not geared



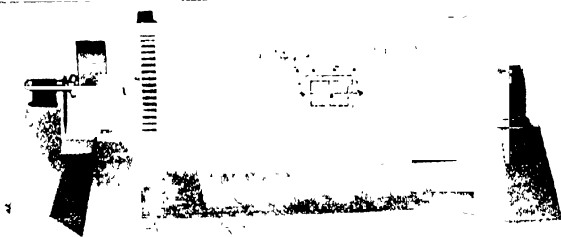
**TYPE "B" PEBBLE MILL**  
Complete with stands  
This type geared

Size	Capacity	H P	Size	Capacity	H P
12" x 19"	45 lbs.	1	2'6" x 3'6"	300 lbs.	3
18" x 25"	85 "	1 1/2	3'0" x 4'0"	500 "	4
24" x 36"	150 "	2	4'0" x 5'0"	1000 "	6
30" x 42"	300 "	3	5'0" x 4'0"	1500 "	10
36" x 48"	500 "	4			
48" x 60"	1000 "	6			



**HEAVY DUTY PEBBLE MILL**  
Fitted with chain oiling engine type bearings

Size	Capacity	H P
6' x 5'	2800	12
6' x 8'	4000	15
6' x 10'	6000	20
7'6" x 5'	4000	18
7'6" x 8'	6000	20
7'6" x 10'	8000	25



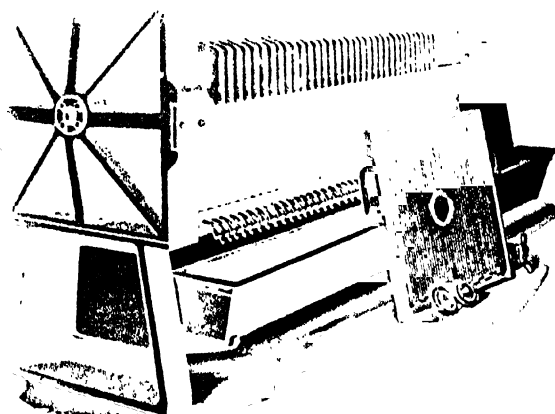
**PATTERSON CONTINUOUS FEED AND DISCHARGE TUBE MILL**  
Supplied with or without feeder

Size	Weight	Pebbles	Speed	H P
4' x 10'	15,000 lbs.	7,000 lbs.	30 R.p.m.	12
4' x 12'	20,000 "	8,500 "	30 R.p.m.	16
4' x 16'	27,000 "	11,000 "	30 R.p.m.	24
4'6" x 16'	30,000 "	13,000 "	28 R.p.m.	30
4'6" x 20'	38,000 "	16,000 "	28 R.p.m.	40
4'6" x 24'	45,000 "	19,500 "	28 R.p.m.	50
5' x 20'	45,000 "	19,500 "	25 R.p.m.	60
5' x 22'	40,000 "	19,000 "	25 R.p.m.	70
5' x 24'	50,000 "	21,000 "	25 R.p.m.	80
5' x 28'	60,000 "	27,000 "	25 R.p.m.	100
6' x 20'	53,000 "	24,000 "	21 R.p.m.	90
6' x 24'	60,000 "	28,000 "	21 R.p.m.	110
6' x 30'	70,000 "	34,000 "	21 R.p.m.	140

## FILTER PRESSES

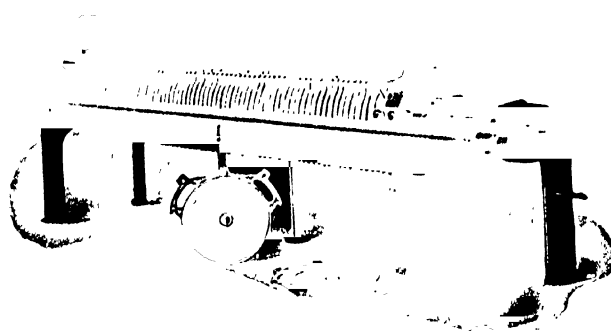
These presses represent the simplest process of separating liquids from solid matter in an economical manner. Built with either round or square plates.

**Square Plate Presses**—Made in 18", 24", 30" and 36" sizes, center and corner feed, plain and washing, either recessed plate or plate and frame types. Regularly equipped with standard closing device, but can be furnished with hydraulic ram for closing.



**SQUARE PLATE FILTER PRESS**

**Round Plate Presses**—Made in 10", 16" and 27" sizes, center feed, either recessed plate or plate and frame types.



**ROUND PLATE FILTER PRESS**  
**DATA PATTERSON FILTER PRESSES**

Square plate				Round plate			
Size	No. chhrs.	Sq. ft. filtering area	Cu. cap. 1 in. cake	Size	No. chhrs.	Sq. ft. filtering area	Cu. cap. 1 in. cake
18	18	70	2.92	28"	72	202	20.5
	12	47	1.95	28"	60	168.5	17
	24	94	3.89	28"	48	134.75	13.5
	30	117	4.87	28"	36	101	10
24	24	169	7.03	28"	24	67.5	6.75
	30	211	8.79				
	36	253	10.25				
	42	295	12.30				
30	24	252	10.50				
	30	315	13.17				
	36	378	15.74				
	48	504	20.98				
36	36	561	23.36				
	42	654	27.26				
	48	748	31.15				
	54	841	35.04				

## SPECIAL CHEMICAL EQUIPMENT

We are prepared to build special agitators, crushers, grinders, mills, mixers, and filter presses to meet any requirements that can not be fulfilled with our regular stock pattern machines.

# PENNSYLVANIA PUMP & COMPRESSOR COMPANY

Manufacturers of Air Compressors, Centrifugal Pumps, Vacuum Pumps  
GENERAL OFFICES AND WORKS: EASTON, PA.

New York  
Philadelphia  
Pittsburgh  
Chicago

Minneapolis  
Omaha  
Birmingham  
Richmond

Cleveland  
Milwaukee  
Salt Lake City  
St. Louis

Detroit  
Columbus  
New Orleans  
Wilkes-Barre

Allentown  
Baltimore  
Montreal  
Vancouver

## PRODUCTS

Manufacturers of Steam and Power Driven Air Compressors and Vacuum Pumps, and of Multi-Stage Centrifugal Pumps.

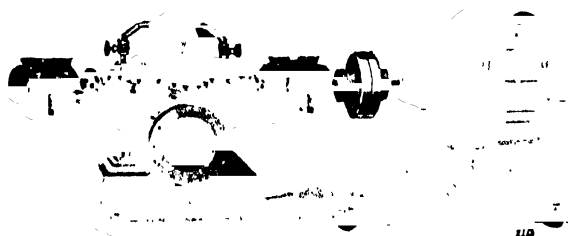
### PENNSYLVANIA DOUBLE SUCTION

#### SINGLE STAGE PUMPS

The Pennsylvania is a product from which frailties of design and manufacture have been eliminated. It is a pump of superior design and is carefully built.

**Features**—Horizontal split casing; Double wearing rings held in place entirely without pins, dowels, etc.; self-aligning bearings, unusual accessibility and careful workmanship.

Built in sizes to handle up to 12,000 gals. per min., for heads to 250 feet, and arranged for any drive.



PENNSYLVANIA SINGLE STAGE PUMP

### PENNSYLVANIA MULTI-STAGE CENTRIFUGAL PUMPS

These pumps are built in the single-suction type in two, three, four or five stages in one casing of the horizontally split type, and in capacities from 100 to 3000 G.P.M. to suit the speeds of the various prime movers such as motor, turbine or belt.

Their design is a decided departure in certain features from the practice followed by all other centrifugal pump manufacturers. These features include exclusive Pennsylvania design (patents pending) and result in a pump that is trouble-proof and reliable in operation.

**Construction**—Pennsylvania construction positively eliminates unbalanced forces in the pump. This is done by carrying the leakage water passing through the sealing ring on the discharge side of impeller, through a connecting passage to the suction side of the same impeller. This connecting passage or balancing port is of sufficiently large area to accommodate a much greater leakage than is normally required. It is ample to insure hydraulic equilibrium even after excessive wear has occurred in the sealing rings.



PENNSYLVANIA MULTI-STAGE CENTRIFUGAL PUMP



## VACUUM PUMPS

These pumps are essentially of the same design as the air compressors, except that the cylinders are proportioned for low pressure work. The inlet valves of this vacuum pump are at the top, and the discharge valves at the bottom of the cylinders. Force feed cylinder lubrication is standard on all our vacuum machines.

### VACUUM PUMPS

Class 7-A Power Driven						Class 8-A Steam Driven					
Cyl- inder Size	R P M	Piston Disp.	B H P Required			Cyl- inder Size	R P M	Piston Disp.	Steam H P Required		
			As Vacuum Pump		As Com- pressor				As Vac Pump		As Vac Comp.
			At 28" Vac	At Peak Load 16"-20" Vac	3 Tps Disch.				At 28" Vac	At Peak Load 16"-20" Vac	3 Tps Disch.
14x 5	350	311	4	13	9	18x 6x 6	325	572	8	24	16
18x 6	325	572	8	24	16	22x 8x 8	300	1052	14	43	26
22x 8	300	1052	14	43	29	24x 9x 9	275	1290	17	52	31
24x 9	275	1290	17	52	35	28x 10x 10	250	1776	22	71	40
28x 10	250	1776	22	71	46	32x 12x 12	225	2502	35	100	55
32x 12	225	2502	35	100	63						

## AIR COMPRESSORS

Pennsylvania Air Compressors are of the straight line, center crank type. Power driven units can be had of either long or short belt drive from electric motor, line shaft or engine. Steam machines are built with a piston valve steam cylinder interposed between main frame and air cylinder.

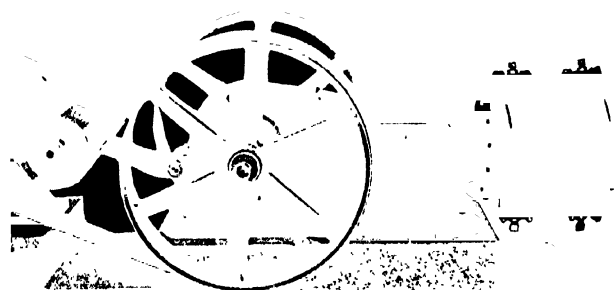
**Features**—A leak proof continuous lubrication system (with sight oil gauge), taper fitted fly-wheels, forged steel crankshaft and connecting rod (closed end type) and Pennsylvania Ring Plate Valves. The inlet and discharge air valves and all their parts are interchangeable. Box type crosshead works in bored guides. Main bearings are renewable bronze bushings.

Pennsylvania Compressors are guaranteed against breakage in normal service for a period of one year.

Class 4-A Steam Driven Machines are built in capacities from 67 to 875 cu. ft. per minute.

### CLASS 3-A POWER DRIVEN AIR COMPRESSORS

Size of Cyl- inder Ins	R P M	Cu. Ft. free air per minute	Air Pressure		B H P.		Size of Cyl- inder Ins	R P M	Cu. Ft. free air per minute	Air Pressure		B H P.	
			Min	Max	Min	Max				Min	Max	Min	Max
5x 5	400	44	75	125	5 1/2	6	10x 9	300	240	50	100	30	40
6x 5	400	65	50	100	7 1/2	9	12x 9	300	348	25	50	31	41
7x 5	400	88	25	50	8 1/2	10 1/2	14x 9	300	477	10	25	31	43
6x 6	350	67	75	125	9 1/2	10	10x 10	275	244	75	125	37	48
7x 6	350	92	50	100	11 1/2	13 1/2	12x 10	275	353	50	100	45	61
8x 6	350	120	25	50	12	15	14x 10	275	485	25	60	43	66
9x 6	350	153	10	25	12	15	16x 10	275	632	15	35	44	67
8x 8	325	148	75	125	22	28	12x 12	250	385	75	125	60	77
9x 8	325	188	50	100	23	30	14x 12	250	525	50	100	65	87
10x 8	325	233	30	50	23	29	16x 12	250	690	25	60	50	96
12x 8	325	336	20	30	29	34	18x 12	250	875	15	35	55	92
9x 9	300	195	75	125	29	35							

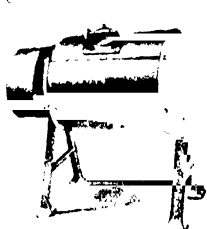


CLASS 3A PENNSYLVANIA COMPRESSOR SHORTBELTED TO MOTOR CATALOGS

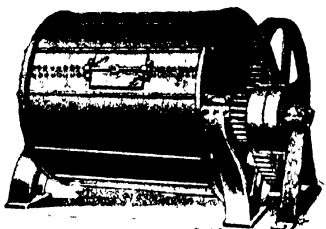
Interested parties are invited to ask for Bulletin No. 101 (Air Compressors and Vacuum Pumps) and No. 201 (Centrifugal Pumps).

# PEBBLE AND TUBE MILLS

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TYPE "E" PEBBLE MILL  
Complete with stands  
This type not geared



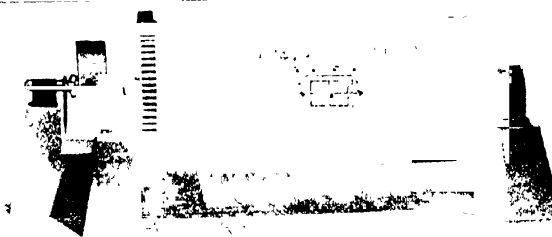
TYPE "B" PEBBLE MILL  
Complete with stands  
This type geared

Size	Capacity	H P	Size	Capacity	H P
12" x 19"	45 lbs.	1	2'6" x 3'6"	300 lbs.	3
18" x 25"	85 "	1 1/2	3'0" x 4'0"	500 "	4
24" x 36"	150 "	2	4'0" x 5'0"	1000 "	6
30" x 42"	300 "	3	5'0" x 4'0"	1500 "	10
36" x 48"	500 "	4			
48" x 60"	1000 "	6			



HEAVY DUTY PEBBLE MILL  
Fitted with chain oiling engine type bearings

Size	Capacity	H P
6' x 5'	2800	12
6' x 8'	4000	15
6' x 10'	6000	20
7'6" x 5'	4000	18
7'6" x 8'	6000	20
7'6" x 10'	8000	25



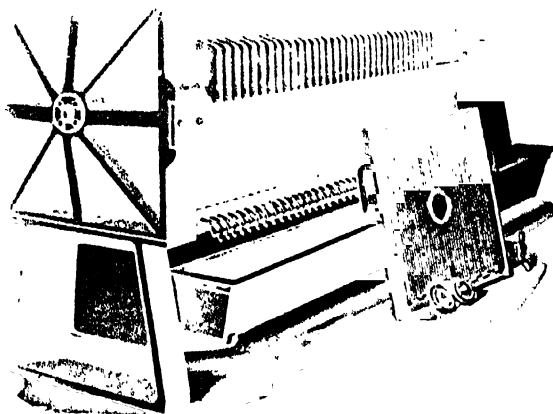
PATTERSON CONTINUOUS FEED AND DISCHARGE TUBE MILL  
Supplied with or without feeder

Size	Weight	Pebbles	Speed	H P
4' x 10'	15,000 lbs.	7,000 lbs.	30 R.p.m.	12
4' x 12'	20,000 "	8,500 "	30 R.p.m.	16
4' x 16'	27,000 "	11,000 "	30 R.p.m.	24
4'6" x 16'	30,000 "	13,000 "	28 R.p.m.	30
4'6" x 20'	38,000 "	16,000 "	28 R.p.m.	40
4'6" x 24'	45,000 "	19,500 "	28 R.p.m.	50
5' x 20'	45,000 "	19,500 "	25 R.p.m.	60
5' x 22'	40,000 "	19,000 "	25 R.p.m.	70
5' x 24'	50,000 "	21,000 "	25 R.p.m.	80
5' x 28'	60,000 "	27,000 "	25 R.p.m.	100
6' x 20'	53,000 "	24,000 "	21 R.p.m.	90
6' x 24'	60,000 "	28,000 "	21 R.p.m.	110
6' x 30'	70,000 "	34,000 "	21 R.p.m.	140

## FILTER PRESSES

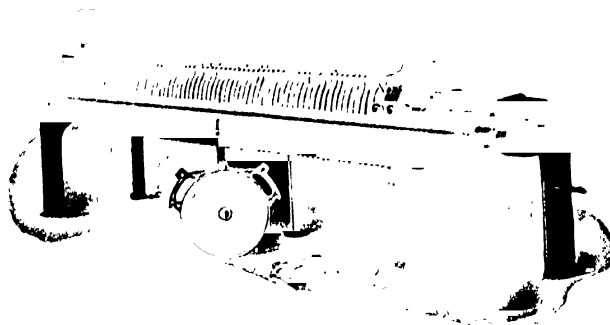
These presses represent the simplest process of separating liquids from solid matter in an economical manner. Built with either round or square plates.

**Square Plate Presses**—Made in 18", 24", 30" and 36" sizes, center and corner feed, plain and washing, either recessed plate or plate and frame types. Regularly equipped with standard closing device, but can be furnished with hydraulic ram for closing.



SQUARE PLATE FILTER PRESS

**Round Plate Presses**—Made in 10", 16" and 27" sizes, center feed, either recessed plate or plate and frame types.



ROUND PLATE FILTER PRESS  
DATA PATTERSON FILTER PRESSES

Square plate				Round plate			
Size	No. chhrs.	Sq. ft. filtering area	Cu. cap. 1 in. cake	Size	No. chhrs.	Sq. ft. filtering area	Cu. cap. 1 in. cake
18	18	70	2.92	28"	72	202	20.5
	12	47	1.95	28"	60	168.5	17
	24	94	3.89	28"	48	134.75	13.5
	30	117	4.87	28"	36	101	10
24	24	169	7.03	28"	24	67.5	6.75
	30	211	8.79				
	36	253	10.25				
	42	295	12.30				
30	24	252	10.50				
	30	315	13.17				
	36	378	15.74				
	48	504	20.98				
36	36	561	23.36				
	42	654	27.26				
	48	748	31.15				
	54	841	35.04				

## SPECIAL CHEMICAL EQUIPMENT

We are prepared to build special agitators, crushers, grinders, mills, mixers, and filter presses to meet any requirements that can not be fulfilled with our regular stock pattern machines.

# PENNSYLVANIA WIRE GLASS COMPANY

EXECUTIVE OFFICES  
 Pennsylvania Building  
 PHILADELPHIA, PA.

Cable Address  
 "WIREGLASS, Philadelphia"

WORKS  
 Dunbar, Pa.

## PRODUCTS

**Solid Wire Glass**, also glass without wire netting, in various patterns and thicknesses.

## PROTECTION

**Wire Glass** is a fire retardant, safeguard to human life, weatherproof, dustproof, reduces insurance rates and is an important factor in the building world.

Wire Glass, when cracked or broken, will not shatter and fall apart, injuring persons underneath, but it will remain intact until replaced, without doing any harm.

Wire Glass, when fire occurs, aids firemen in fighting the flames, as they have the protection of the glass back of which to fight with hose that can be put through a small opening in the glass.

Wire Glass prevents flames from attacking adjacent buildings.

## USES

**Wire Glass** is used in all light openings where **fire protection** and **light** are desirable, such as in windows, doors, elevator enclosures, fire shutters, partitions, etc.

## PATTERNS

Rough, Ribbed, Aqueduct (Drip-proof), Figured (Cobweb) and Florentine, Polished (Transparent), and Corrugated Wire Glass (see opposite page).

## THICKNESSES

$\frac{1}{8}$ ",  $\frac{3}{16}$ ",  $\frac{1}{4}$ ",  $\frac{3}{8}$ ", to suit all requirements.

## SIZES

Sheets made up to 62" wide by 140" long. Special sizes cut to order.

## APPROVAL, DISTINGUISHING MARK

All our **Wire Glass**,  $\frac{1}{4}$ " and over in thickness, has the **full approval** of the National Board of Fire Underwriters, which requires a distinguishing mark to identify the glass. Our distinguishing mark is our **Cabled Strand**, shown by arrow in illustration of polished wire glass.

## HOW TO SPECIFY

In order to get our glass, be sure to specify "**Solid Wire Glass** made by the Pennsylvania Wire Glass Co."

Always look for **Cabled Strand**.

Specify width (i.e., distance across sheet) first; then length.

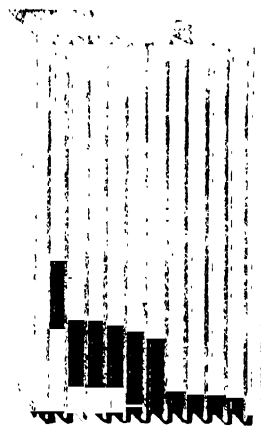
Always specify thickness and pattern desired.



## SPECIALTIES

We make glass to suit every requirement. For many purposes, such as transoms, partitions, doors, etc., a thin wire glass is desirable. To meet this demand, we make thick Wire Glass in patterns as shown. This affords great saving in freight, as well as a steel sash, being so much lighter in weight than  $\frac{1}{4}$ ".

$\frac{1}{8}$ " wire glass affords moderate fire protection.



**AQUEDUCT WIRE**  
 Drip proof

## AQUEDUCT

Another glass greatly in demand is **Aqueduct Wire Glass**, which prevents dripping from condensation. Aqueduct glass has deep supporting ribs or channels, and by capillary attraction, all condensation formed on the glass is held in the ribs and carried away, along the ribs, to the end of the sheet where it is taken care of.

**Aqueduct** is a great light diffuser and is very much stronger than other flat glass of like thickness.

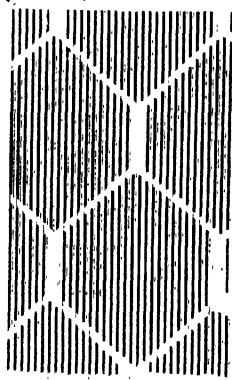
## COBWEB

**Cobweb** is an attractive figured glass which affords great diffusion of light. It is what is known as an "up-set" pattern. Used in partitions, transoms, doors, windows, etc.

## CORRUGATED WIRE GLASS

**C.W.G.** is another special product, one that has revolutionized the glass and building trades. For details see opposite page.

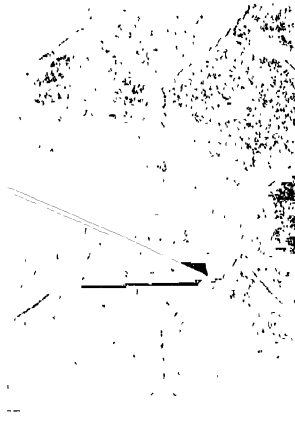
**CATALOGS, SAMPLES, ENGINEERING ADVICE, ETC., FURNISHED WITHOUT OBLIGATION**



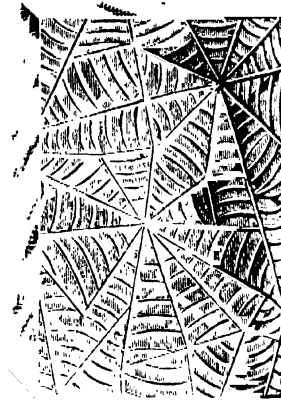
**RIBBED WIRE**



**ROUGH WIRE**



**POLISHED WIRE**  
 Transparent



**COBWEB WIRE**  
 New and unique

*Continued on Next Page*

**CORRUGATED WIRE GLASS**

C.W.G. is what the name implies—a sheet of **Wire Glass** corrugated like corrugated iron. (See illustration below showing joint, etc.)

**Thickness**—C.W.G. is about 5/16" thick. Made in deep and shallow angles.

**Deep**—2 1/2" c. to c. of corrugations.

**Shallow**—2 11/16" c. to c. of corrugations.

**Standard Sizes—**

**Deep**—27 3/4" wide by 63" and 42" long.

**Shallow**—26 1/2" wide by 63" and 42" long.

(Other sizes can be cut if required.)

**Weight**—C.W.G. weighs about 4 1/4 lb. to the square foot unboxed and about 6 lb. boxed.

**Uses**—C.W.G. can be used in Roofs, Skylights, Side-Walls, Marquises, and any place where **Daylight** and **Fire Protection** are required.

Can be used in **old as well as new** buildings; also in combination with corrugated iron and asbestos.

**Advantages**—C.W.G. affords an all glass **daylight building**, with **no glare** or shadow.

C.W.G. diffuses the light and spreads it evenly to all parts of the building.

C.W.G. is the strongest glass made. This is due to the corrugation and method of manufacture.

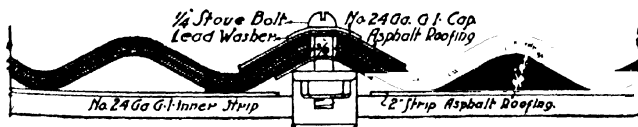
C.W.G. is easily and quickly installed; no skilled labor required; little upkeep.

C.W.G. is self-cleaning; cleans itself at each rain-storm.

C.W.G. affords great saving in steel; no special steel members required.

C.W.G., when installed, has ample room for expansion and contraction.

**Each joint an expansion joint.**



ILLUSTRATING EXPANSION JOINT FEATURE

**Engineering Service**—Our staff of engineers will submit working details and suggestions at all times, without obligation, and will make drawing showing how C.W.G. can best be applied to any particular requirement.

**Send for Catalog No. 7; also samples.**

**ACTINIC (NO. 213) GLASS****HEAT INTERCEPTING**

**Ultra Violet and Infra Red Rays** excluded by Actinic glass.

A special glass manufactured by this company only, it having been developed by it after long and arduous experiments.

No. 213 (Actinic) glass tested by U. S. Bureau of Standards. We will submit report if desired.

Actinic glass excludes about 85% of the ultra violet (glare) and 55% of the infra red (heat) rays, with exclusion of very little light.

**Surfaces and Thickness**—Actinic (No. 213) glass is made in Corrugated and all patterns and thicknesses to suit requirements. It is the ingredients in and not the color of glass that produce these results.

**Protection**—The protection of mills manufacturing products that are damaged by the action of ultra violet rays, such as rubber, etc.

Protection to the eyes (workers') by the exclusion of the infra red rays, eminent authority states:

"Heat Rays tire the eye when in excess, just the same as an overheated room tires the body."

No. 213 glass excludes a large proportion of the heat rays, thereby promoting efficiency.

**The Human Machine**—"The three important elements of the human machine are the brain, the eyes and the fingers. The eyes perceive, the brain directs and the fingers execute. To enable the eye to perform its function with the greatest possible ease and accuracy is therefore of first importance in any consideration of the conditions determining operative efficiency."

**Glare**—"Care should be taken to keep bright light sources out of the line of vision, no matter how distant they may be." Hence, the diffusion of the light rays by **corrugated wire glass** No. 213 is so essential.

**Light and the Eye**—"Ultra Violet Rays by their intense chemical action, have a destructive effect upon certain tissues of the organs of vision."

"The absence of **Red Rays** is also an advantage in removing one of the chief causes of eye fatigue and irritation."

Such harmful effects are eliminated, and all the **Actinic** advantages may be obtained by the use of our No. 213 glass.

# THE PERMUTIT COMPANY

## Water Rectification

Telephone  
MADISON SQUARE 965

440 FOURTH AVENUE, NEW YORK, N. Y.

Cable Address  
"PERMUTIT", New York

Albany, N. Y., 310 Journal Company Building  
Boston, Mass., 10 Milk Street  
Buffalo, N. Y., 304 Brisbane Building

Chattanooga, Tenn., 435 Volunteer State Bldg  
Chicago, Ill., 208 So. LaSalle Street  
Kansas City, Mo., 507 8 Lathrop Building  
Los Angeles, Cal., 404 Wright Callender Bldg

Minneapolis, Minn., 1046 McKnight Bldg  
Pittsburgh, Pa., 921 Union Arcade  
Philadelphia, Pa., 311 Widener Building

### BRANCH OFFICES

### AGENTS

St. Louis, Mo., Reeves & Skinner Mch. Co., 2211 Olive Street  
Hamilton, Ontario, Can., W. J. Westaway Co., Main and McNab Sts.

Montreal, Quebec, Can., W. J. Westaway Co., 400 McGill Bldg  
Winnipeg, Manitoba, Canada, Stanley Brock, Ltd.

## PRODUCTS

"Permutit" Zeolite Water Softeners, pressure and gravity types; Lime-Soda Softeners, intermittent, continuous and heater types; Lime-Barium Softeners, hot or cold types; Iron and Manganese Removal Apparatus, zeolite, mechanical and chemical types; steel, wood or concrete Clarifying Filters, pressure and gravity types; Filtration Equipment; Chemical Dosing Apparatus; Controllers; Gauges; Operating Tables; Oil, Sulphuretted Hydrogen, Chlorine, Ammonia, Removal Filters; Permutit-Folin for estimating ammonia in liquids.

## ZEOLITE WATER SOFTENERS

The application of exchange silicates to water softening has been developed to such perfection by The Permutit Company, that water in any degree of hardness may now be softened to zero hardness with absolute dependability and scientific accuracy.

## SOFTENING WATER WITHOUT CHEMICAL RE-AGENTS

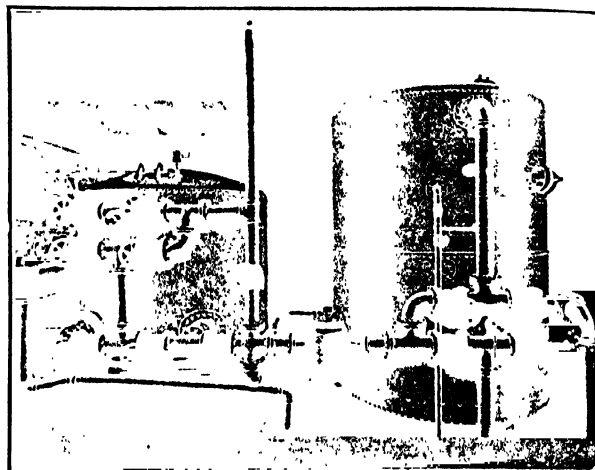
Upon passing water containing hardness through the Permutit Softener, the calcium and magnesium are completely exchanged for the sodium of the zeolite, and a neutral effluent is obtained, containing the equivalent of the original solids in harmless sodium salts, and free from hardness. The effluent is free from causticity, the process takes place in the cold, and the reaction is accomplished rapidly and perfectly. When all the effective sodium in the zeolite has thus been exchanged, it is restored by the simple means of passing a solution of common salt through it, the reverse action taking place. The sodium replaces the calcium and magnesium, which is discharged to the sewer, as a corresponding brine.

## WATER SOFTENERS, ALL TYPES

The Permutit Company manufactures Lime-Soda, Lime-Barium Softeners of the intermittent or continuous types, for heater operation, or in the cold. They are designed to accurately serve every industrial need. Each machine is the perfected development of many years' experience in water softening, and represents the best acknowledged features of design with utmost dependability and economy of operation.

## IRON AND MANGANESE REMOVAL

Iron and Manganese Removal Apparatus is generally complex in character and consists typically of combinations of apparatus developed and perfected for such work. Iron and manganese, whether in solution or suspension, whether existing as organic or inorganic salts, can be reduced to negligible quantities. Special Manganese Permutit has tremendous oxidizing powers and transforms manganese salts into insoluble oxides, removing them as the water passes through the bed.



A "PERMUTIT" ZEOLITE WATER SOFTENER AND "PERMUTIT" CLARIFYING FILTER

## SPECIAL APPARATUS

Special apparatus for the removal of oil, sulphuretted hydrogen, chlorine, ammonia, etc. from water and, in conjunction with it, all types of correlated equipment such as chemical dosing apparatus, is sold under strict operating guarantees. Each piece is carefully designed and fabricated, and gives perfect satisfaction.

## CLARIFYING FILTERS

Filters for removing turbidity and matter in solution are built in all sizes, for any capacity, to clarify water for any use. Such filters are made in pressure types of steel, and in gravity types of steel, wood, or concrete. They follow the principles of careful design and excellent construction that characterize all Permutit Products. Filtration equipment such as chemical feeding and solution apparatus, control devices, operating mechanisms, relief valves, laboratory equipment, is carefully correlated with Permutit filtration systems wherever sold, and carries with it the same guarantees.

## SERVICE

Every piece of apparatus is sold by the Permutit Company under a definite guarantee of operation based upon an accurate analysis of the water supply and the requirements of the purchaser. A staff of engineers is maintained constantly in the field to assure the correct operation and to check the performance records of our installations, so that in buying Permutit equipment, you purchase not only excellent machinery but the hearty co-operation of a widely experienced organization as well. Send us a sample of your water for analysis.



# LEONARD PETERSON & CO., INC.

Manufacturers of High Grade Laboratory Furniture

1222-1234 Fullerton Avenue

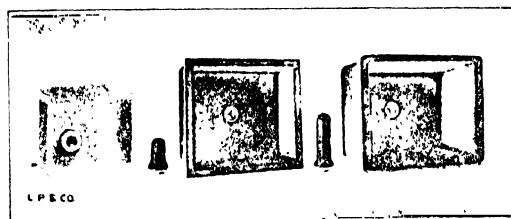
CHICAGO, ILL.

## PRODUCTS

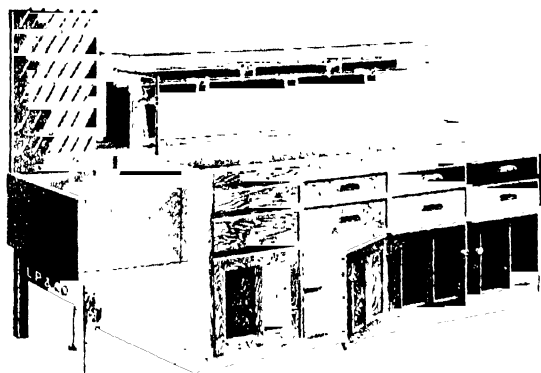
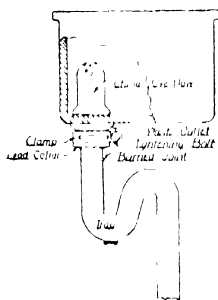
Laboratory Furniture for Industrial Plants, Commercial Laboratories, Educational Institutions, Hospitals, Domestic Science, Etc. We furnish the equipment complete, including Tables and Desks, Fume and Evaporating Hoods, Supply Cases, Acidproof Sinks, Gutters and Tops, Plumbing for Waste, Water, Gas, Air, Steam and Vacuum.

## EXPERIENCE

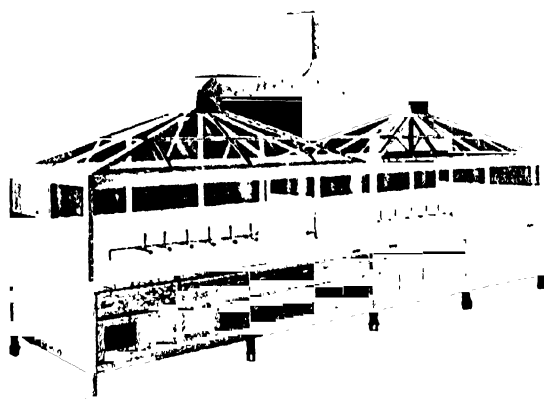
The rapid growth of laboratories induced us to specialize in the manufacture of high grade furniture for all kinds of laboratories. For the past thirty years we have given special attention to the manufacturing of laboratory furniture. Our experience, plus frequent conferences with acknowledged authorities in science, enables us to furnish equipment that is in keeping with the growing demands of various sciences and industries.



ACIDPROOF  
VITREOUS CHINA  
SINKS



LABORATORY TABLE NO. 1023



CHEMISTRY FUME HOOD NO. 1000

## SERVICE

Copy of our catalog showing various exclusive designs of laboratory furniture (a number of which are carried in stock for immediate shipment) will be mailed upon request. In addition to designs shown in our catalog, we also manufacture special designs.

If you intend furnishing a laboratory or are in the market for additional equipment, mail us a floor plan of the rooms you wish furnished, together with your suggestions and we will be pleased to send you blue prints, specifications, and estimate. This service is without cost or obligation.

We are located in the principal distributing center of the United States. Our shipping facilities are first class. In order to obtain the lowest freight rates possible, we ship all large pieces of furniture knocked down shape.

## AMONG OUR CUSTOMERS WE WISH TO MENTION

Inland Steel Co.,	University of North Dakota,
Indiana Harbor, Ind.	Grand Forks, N. D.
Newport Co.,	East Side High School,
Carrollville, Wis.	Cincinnati, Ohio.
New Jersey Zinc Co.,	Dunlop Rubber & Tire
Palmerton, Pa.	Co.,
Mechanical Rubber Co.,	Buffalo, N. Y.
Cleveland, Ohio.	Carleton College,
Oakland Motor Car Co.,	Northfield, Minn.
Pontiac, Mich.	Tubize Artificial Silk Co.,
National Candy Co.,	Hopewell, Va.
Chicago, Ill.	University of Alabama,
Timken Roller Bearing	Tuscaloosa, Ala.
Co.,	Washington University,
Canton, Ohio.	St. Louis, Mo.
Nekoosa Edwards Paper Co.,	
Port Edwards, Wis.	

ROBERT S. PERRY, Pres.

Paul W. Webster, V. P. and Gen. Mgr.

**PERRY & WEBSTER INC.**

FORMERLY

Kallperry Corporation

Telephone  
STUYVESANT 7308Cable Address  
"PERWEB," New York

31 UNION SQUARE WEST, NEW YORK, N. Y.

**SERVICES**

**Investigation of process problems and economies and utilization of wastes.**

**Design and supervision of plant and apparatus for technical manufacture of Chemicals, Metallurgical Products and Pigments, Paints and Varnish Productions.**

**Confidential investigations and reports for Executives, Banking and Financial interests.**

**Stackless Varnish Plants, Fume Recovery, Concentrating, Evaporating and Drying.**

**Concentrating Towers for sulphuric acid and other concentrations and spent acid recoveries.**

**Leak Proof All Masonry Construction for Glover, Gay Lussac and Chemical Treatment Towers and similar apparatus.**

We design and furnish detailed plans, specifications, flow sheets, and instructions, for the erection and operation of chemical, metallurgical, paint, varnish, and other industrial projects; and where desired "house-break" new operations and train employees.

We investigate operating or projected industrial activities for economy, efficiency, and feasibility, and to determine methods for improvement or the manufacture of desired products.

We do not undertake construction contracts nor purchase or sell materials, but sell only our services, and our experience, gained over many years as Executives, Constructors, and Operators, of manufacturing chemical, metallurgical and industrial enterprises.

We do give clients all information in our possession as to where specified materials and apparatus may be obtained, thus permitting contracts and purchases on a competitive basis in which we have no other interests than that of our client's welfare, and upon which we will accept no commissions of any character.

We believe that, having been engaged by a client, we become, in effect, a part of the client's organization and that our best interest lies in the scope and high character of the service we render.

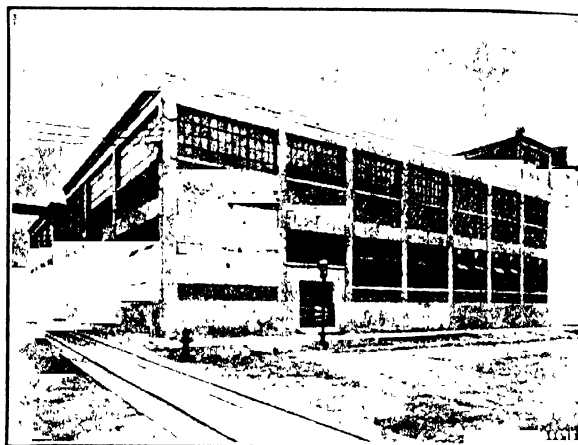
**VARNISH FUME RECOVERY AND MULTIPLE STORY STACKLESS VARNISH PLANTS**

The loss in "cooking" varnishes and similar products runs as high as forty per cent., the valuable portions of which are recoverable as usable products by our system of fume recovery.

The recoverable values are usually sufficient to pay for the entire cost of installation in from one to two years and the fume and smell is eliminated from the plant and neighborhood.

Fire risk with loss of goods in process is greatly reduced and large reductions in insurance rates have been obtained by our clients.

Our system does not interfere with or change pre-existing manufacturing methods or products.



**A MODERN VARNISH PLANT OF 24 FIRES**  
Stackless, Odorless, Fire Preventive, Storage, Light

It is applicable to recoveries from Japans, Oils, etc., with proportionate results and it may be installed in existing plant.

The cost of operation is nominal and the cost of installation less than for brick stacks which are not required, and multiple story boiling plants are built with advantage.

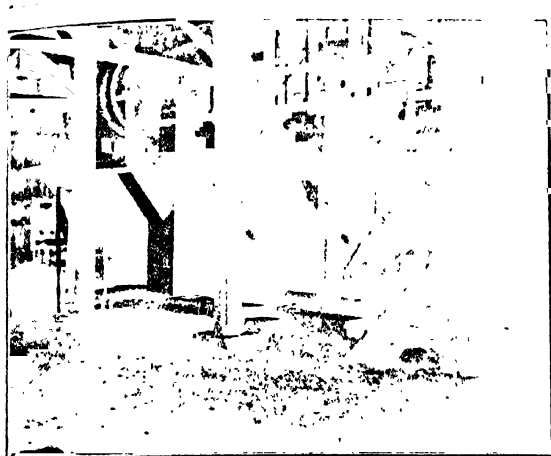
Such plants are lighted from all four sides, provide storage for gums and oils in the top story from which they may be weighed and delivered direct into kettles on a lower story with minimum labor and with complete safety from accidental fire, provide storage for finished goods on a floor below the manufacturing room, and give package and shipping facilities on the ground floor.

We have furnished complete plans for plants of such multi-story construction, and for installation of our system in old style stack plants, to numerous clients among whom are some of the oldest and largest manufacturers of varnishes and similar products.

Special bulletins and descriptive information will be sent upon request.

Estimates of cost and license and engineering fees will be furnished upon information as to the number of fires, character of manufacturing operations, and, if for installation in an existing plant, sketches or description of the plant.

*Continued on Next Page*



PLANT FOR THE CONTINUOUS EXTRACTION OF SULPHUR FROM SURFACE ORES. TOYAH VALLEY SULPHUR CO.

### CHEMICAL FUME, DUST, ODOR, PREVENTION OR SUPPRESSION

Standardized apparatus generally used for dust collection and similar problems is rarely satisfactory and we provide the remedy in special designs and processes and have a record for valuable recoveries including even commercial returns from smell nuisances.

We have yet to record a failure in this class of work.

### CONCENTRATING TOWERS

These towers, originally designed for the concentration of sulphuric acid, have been in successful commercial use for many years. They are applicable to the concentration and evaporation of other liquids at a very low cost and provide the cheapest known means for the commercial concentration of sulphuric acid.

They are quickly constructed from standard stock materials at low first cost, and, with almost complete freedom from repairs, are operated at practically the cost of fuel, with minimum labor.

### LEAK PROOF MASONRY CONSTRUCTION FOR GLOVER, GAY LUSSAC, CONCENTRATING, DENITRATING AND TREATMENT TOWERS

Many attempts have been made to omit lead or other sheathing in constructing masonry towers, but with indifferent success owing to the fact, inherent in operation, that the unequal expansion induced by unequal temperature changes, impossible to avoid, is greater than the elasticity of the materials of construction; with the inevitable formation, sooner or later, of cracks in the masonry.

In our method of leak-proof masonry construction the attempt is not made to achieve the impossible, but, by a novel method of construction such inevitable cracking as will take place is so controlled as not to extend to the exterior and the necessity of sheathing with its accompanying cost is rendered unnecessary.

Estimates of construction cost furnished upon information of requirements.

### DRYERS AND DRYING

In our dryers the basic laws of heat transference, evaporation, the moisture carrying properties of air, gases, etc., have been recognized and applied with engineering skill in the economic use of materials of construction, to produce the greatest efficiency of drying, with special reference to economy in labor cost of handling materials, and are designed in each instance to meet the conditions of the specific problem.

Inquiries for information should give full information as to material and its physical form and condition, moisture content carried and desired, quantity to be handled per unit of time, available sources of heat, maximum temperature which the material itself may be allowed to attain without injury, description of existing means for drying, and any general information bearing on the problem.

### PURIFICATION AND DEODORIZING OF VEGETABLE AND ANIMAL OILS

By a new and novel process in the application of heat, vacuum temperatures and conditions are approximated in open vessels and without the expensive apparatus used for vacuum operations.

The low investment cost as compared with vacuum apparatus, or with high pressure super-heated steam apparatus, the operating cost approximating vacuum results with ability to maintain low temperatures, the extreme simplicity and low maintenance cost and continuous operation all combine to make this the ideal method of purifying and deodorizing animal and vegetable oils.

### CONCENTRATION AND EVAPORATION OF LIQUIDS AND SEMI-LIQUIDS

The above apparatus has a wide field of application for this work.

The apparatus is easily and quickly installed, gives continuous operation at very low cost, and with its operation at vacuum temperatures under atmospheric pressures offers many surprising possibilities.

### ACTIVITIES

Space prevents enumeration of all the various activities with which the members of our organization have been intimately connected but they include all the mineral acids, lactic acid, chemical salts, alum, and alumina hydrate, pigments, paints, varnishes, red and white lead, many chemical and paint specialties, lithopone, blanc fixe, the drying of materials, and concentration and evaporation of liquids and semi-liquids, the general fabrication of iron and steel products, machinery, and concrete construction.

# THE PFAUDLER COMPANY

## The World's Largest Makers of Glass Lined Steel Equipment

### ROCHESTER, N. Y., U. S. A.

New York, 1402 World's Tower Bldg

Chicago, 1442 Conway Bldg

San Francisco, 206 Sharon Bldg

Enamelled Metal Products Corp., Imperial Bldg., 56 Kingsway, London, W. C. 2, England  
 Mauri Bros. & Thompson, 121-131 Castlereagh St., Sydney, N. S. W., Australia

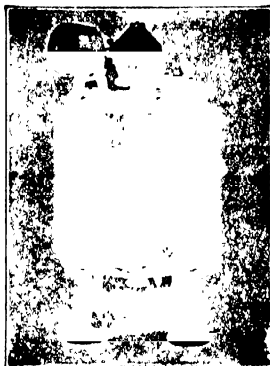
#### PRODUCTS

Glass Lined Mixing and Storage Tanks, Steam Jacketed Kettles, Vacuum Pans, Pressed Steel Pots and Small Tanks, Jacketed Stills, Crystallizing and Evaporating Pans, Vats, Tilting Kettles and Percolators, Truck and Car Tanks, Laundry Chutes, etc.

This equipment is lined with an impenetrable coating of glass, acid resistant, easy to clean, and not subject to the effects of sudden changes in temperature. This glass lining is fused into the metal of the equipment so that it is in reality an integral part thereof,—gives to the plant the same advantages of using glass lined containers in large scale operations as is present in the use of laboratory glassware, with the additional advantage of durability of steel.

#### JACKETED MIXER (with enameled steel agitator)

This tank is made of all-welded, heavy plate steel, is lined with the famous Pfaudler Brown Acid-resistant Glass Enamel, and is equipped with our standard, enameled steel agitator. The jacket of this tank, as of all our other models, is constructed of steel which is as thick as that of the inner tank itself. The gears are made of cut steel, and are enclosed in a housing, as shown.



**JACKETED MIXER**  
Showing construction

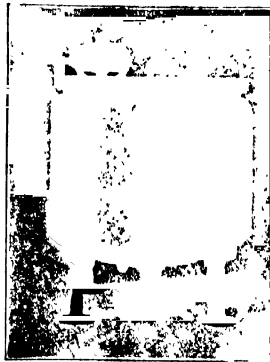
The inner tank has an enameled outlet through a welded connection in the jacket, which feature eliminates leaky stuffing boxes. Flanged or threaded nozzles, or other suitable openings are provided. The manhole cover is also enameled, and is secured either as illustrated, or by hinges. This type is suitable for use in the manufacture of raw chemicals, dyes, printing inks, coal tar by-products, etc.

Capacity—150 gallons and upward.

#### JACKETED MIXER (with agitator off center)

This tank will provide for very thorough agitation, and has solved many difficult problems in mixing. It is equipped with our standard enameled steel agitator, and can be furnished with a removable cover.

Capacities—50 gallons and upward.



**JACKETED MIXER**  
Agitator off center

**PARTIAL LIST OF SOLUTIONS HELD IN PFAUDLER EQUIPMENT**  
 Hydrochloric Acid (dilute or concentrated), Sulphuric Acid (dilute or concentrated), Arsenic Acid, Muratic Acid, Rectified Alcohol, Nitric Acid (dilute or concentrated), Paratoluidine, Amylacetate, etc.

#### JACKETED STILL (with reducing ell)

Jacket and Enameled Body of this still are welded into a single piece; the top head is bolted on, and is furnished with observation glasses; the manhole cover is enameled, and is secured in the same way as on the Jacketed Mixer. There is an enameled reducing ell, bolted to the welded-on, flanged nozzle in the head, and designed for attachment to a condenser. There is also a flanged or threaded enameled outlet through a special connection welded to the jacket. This type is suitable for the distillation of essential oils, and acids, the reduction of fats, etc.

Capacities—50 gallons and upward.

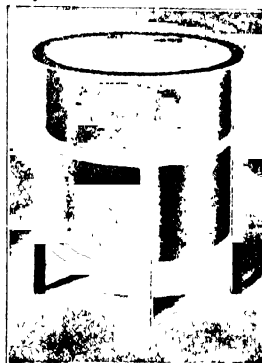


**JACKETED STILL**

#### SMALL TANKS AND POTS

This pot is made of pressed steel, seamless drawn, and is well suited for the handling of small batches, and for experimental work. It is equipped with a basket support, as shown, and is light enough to be easily handled.

Capacities—10 to 60 gallons.

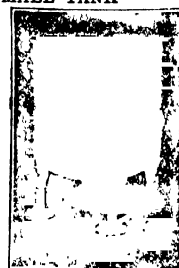


**SMALL TANK**

#### ONE PIECE OPEN TANK

This tank is all welded, and is our standard open construction. It may be equipped either with welded-on enameled, flanged, or threaded nozzles, or with standard pipe bushings. It may also be furnished with the standard side agitator. This type is suitable for temporary storage and holding, intermediate holding, etc.

Capacities—50 gallons and upward.

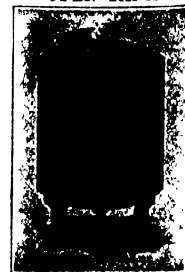


**OPEN TANK**

#### ONE PIECE CLOSED TANK

This tank is also all-welded, is provided with suitable outlets, and with side agitator, if desired. It is suitable for the storage of such products as perfumes, essential oils, etc.

Capacities—200 gallons and upward. Similar construction can be furnished in smaller sizes.



**CLOSED TANK**

**PARTIAL LIST OF INDUSTRIES USING PFAUDLER EQUIPMENT**  
 General Chemical, General Cosmetic, Pharmaceutical, Food and Canning, Dairy, Beverage, Hospital Field, etc.

# THE PHILADELPHIA DRYING MACHINERY CO.

"Hurricane" Dryers

PHILADELPHIA, PA.

NEW YORK OFFICE AND WORKS  
51 Stokely St.

BOSTON OFFICE  
54 State St.

## PRODUCTS

"Hurricane" Dryers of the Truck Tray type, Cabinet Tray type and Continuous Conveyor type, built for the color, chemical, dyestuff, pharmaceutical, textile, leather, tobacco and allied industries.

## DESCRIPTION

"Hurricane" Dryers consist of a rigid, structural steel framework, assembled in accordance with the latest approved engineering practice, with removable

Because of the simple, fire-proof construction, the efficient recirculation system, and easy operation of the machines, vast economy is effected in time, labor, floor space and steam consumption.

Uniform drying of the material is absolutely guaranteed.

## DESIGN

During our many years of drying experience, we have designed standardized equipment of various sizes



**AUTOMATIC SECTIONAL APRON DRYER**

For Raw Stock, Nitrated Cotton, Reclaimed Rubber, Rags, Hair, etc.



**TRUCK DRYER**

For Chemicals, Colors, Dyestuffs, etc.

outside panels of sheet steel insulated with asbestos, which retain the heat, and at all times give easy access to the interior of the machine.

These panels are excellent non-conductors. They are securely attached to the framework by means of strong hand latches, and prevent the escape of heat from the dryer.

The drying is accomplished by the recirculation of large volumes of heated air, driven by means of steel-blade fans, alternately across the steam coils and over the wet material. Special exhaust ducts carry away the excess moisture-laden air, and the intake ducts supply a sufficient amount of fresh air. The temperature in the dryer can be controlled automatically.



**TUNNEL TRUCK DRYER**

For Lithopone, White Lead, Dry Colors, Ceramic Ware, etc.



**CABINET TRAY DRYER**

For Chemicals, Pharmaceuticals, etc.

and capacities, to suit all ordinary requirements. Where these standard machines cannot be used, we are prepared to submit plans and details for special apparatus to suit the particular needs.

## SOLVING YOUR DRYING PROBLEMS

Our Research Department, fully equipped with experimental dryers, operated on a commercial scale, is at your disposal. You can call on us at any time, without expense or obligation, to assist you in solving your drying problems.

Send us samples of the materials to be dried. They will be promptly tested and returned to you, with a report of the results obtained and our recommendations as to the best and most efficient methods for handling your products during the drying operation.

# PHOTOSTAT CORPORATION

299 STATE ST., ROCHESTER, NEW YORK

Boston  
88 Broad Street

Chicago  
19 South La Salle Street

New York  
7 Day St

Philadelphia  
1102 North American Building

San Francisco  
429 Monadnock Building

Washington  
700 G Street N.

Executive Office: Providence, R. I.

## AGENCIES

Alfred Herbert, Ltd., Coventry, England, Paris, France, Milano, Italy, Brussels, Belgium  
Amsterdam, Holland, Calcutta, India, Yokohama, Japan, Sydney, Australia  
Graham Brothers, Stockholm, Sweden

## PRODUCTS

### The Photostat.

The photographic copying machine.

### Photostat Paper.

### Photostat Chemicals.

The word **Photostat** is the registered trade-mark for our products in the United States, Canada, Great Britain, and most of the other countries of the world.

## DESCRIPTION

The machine is loaded with a roll of special sensitized paper. The subject to be copied is photographed directly upon this paper and no intermediate film or glass plate negative is used. As fast as the photographic copies are exposed they are cut off and developed and fixed right in the Photostat itself. The copies are then washed and dried and are ready for use. The whole operation takes but a few minutes.

The Photostat is made in three models, all of them equipped with either a book holder or an engineering copy board.

PHOTOSTAT DATA

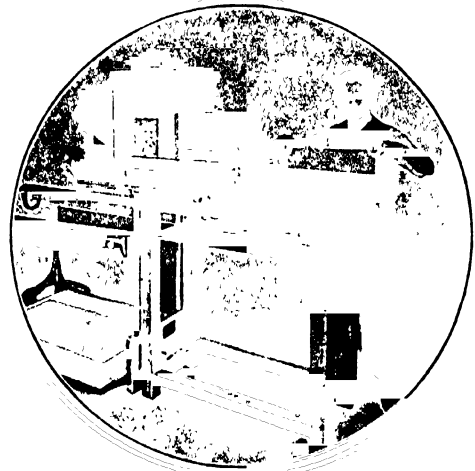
Model No.	Largest Size of Copy	Size of Book Holder	Size of Engineering Copy Board	Floor Space
1	11½" x 14"	21" x 26"	21" x 36"	4' x 8'
2	14" x 18"	21" x 26"	31" x 40"	5' x 10'
3	18" x 22"	21" x 26"	39" x 48"	6' x 12'

All of these models can be readily adjusted to copy subjects larger than the copy boards if desired.

## USES

To make copies of:

Pencil Drawings,  
Ink Drawings,  
Blue Prints,  
Tracings,  
Sketches,  
Maps,  
Letters,  
Telegrams,  
Tabulations,  
Record Cards,  
Reports,  
Contracts,  
Documents,  
Specifications,  
Data Sheets,  
Pages from Books,  
Insurance Records,  
Shipping Lists,  
Patent Drawings,  
Illustrations for Salesmen,  
Production Sheets,  
Advertising Layouts.



PHOTOSTAT IN USE

# PIPE RAILING CONSTRUCTION CO.

LONG ISLAND CITY, N. Y.

## PRODUCTS

Pipe Railings of Black and Galvanized Iron and Steel Pipe for:

Bench frames	Retaining wall railings
Boardwalk railings	Runway railings
Bridge railings	Stair railings for
Drying racks	Concrete, Iron or
Engine room railings	Spiral stairways
Fencing	Storage racks
Gallery railings	Table frames
Machine guards	Turnstiles
Panel board frames	Walkway railings
Platform railings	Workbench frames

We also produce Special Fittings.

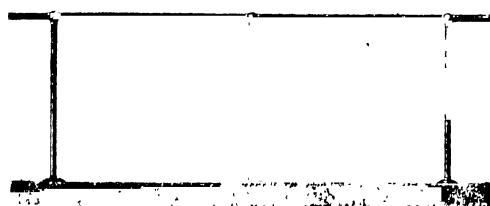
## SERVICES

Our service consists of making up, from customers' dimension drawings, railings or special forms from pipe and fittings. When desired, we will prepare drawings and submit estimates if conditions and measurements are furnished.

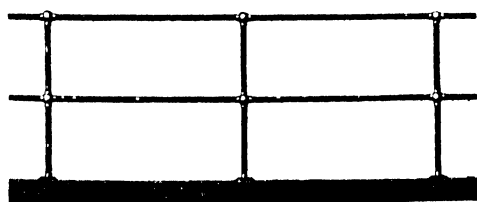
## PIPE RAILINGS

These railings are made up of iron or steel pipe with the necessary fittings such as elbows, tees, crosses, bends and foot plates. All cutting, threading and fitting is done in our shops where we have the necessary machinery to perform the various operations accurately. This eliminates all unnecessary preliminary fitting and cutting, and saves considerable time in the erection of the railing.

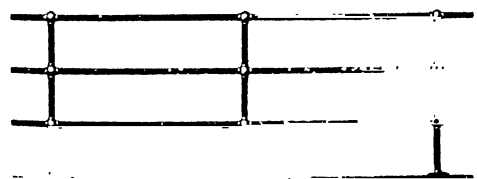
Posts and as many units as possible are assembled in the shop, horizontal and long vertical lengths of pipe are cut, bent if necessary, and threaded, and each piece marked to facilitate erection.



SINGLE LINE RAILING



DOUBLE LINE RAILING

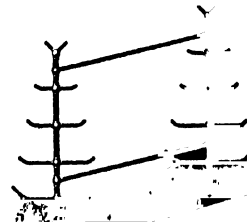
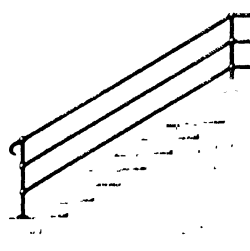
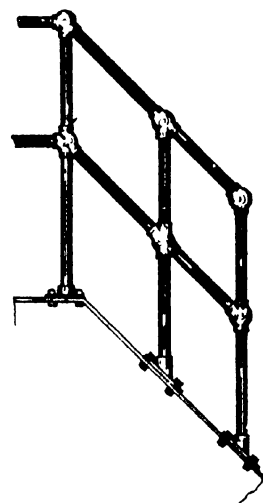


TRIPLE LINE RAILING

**Advantages** - A railing of iron or steel pipe is more durable and affords greater protection than wooden railings which are more likely to break under sudden or undue strains. The pipe railing is also less expensive than mesh or picket fencing, and furthermore is more easily made up for short turns, off-sets, or irregular shapes.

## SPECIAL FORMS

Aside from our regular business of making pipe railings, we are also prepared to make special forms of equipment using pipe and fittings. These comprise table and bench frames, racks of all kinds, machine guard skeletons, etc.



A FEW APPLICATIONS OF PIPE RAILINGS

## SPECIAL CAST FITTINGS

Through our patternshop and foundry connections we are in an excellent position to make, in any quantity desired, special flanges, brackets, elbows, extra heavy bends and special Y-fittings with one or more branches. All threading and tapping is done in our own shop.

## INQUIRIES

When asking quotations for railings, special forms or special fittings, send dimension drawings or blue prints and specifications stating the sizes and quantity desired.

# PITTSBURGH VALVE, FOUNDRY AND CONSTRUCTION COMPANY

ENGINEERS

FOUNDERS

PIPE-FITTERS

MACHINISTS

NEW YORK, 30 Church St.

26th Street and A. V. R. R.

PHILADELPHIA, 1323 Widener Bldg.

CHICAGO, 650 McCormick Bldg.

PITTSBURGH, PA.

CLEVELAND, 1250 Rockefeller Bldg.



## PRODUCTS:

COMPLETE PIPING SYSTEMS for Industrial Chemical Plants of every Description for handling Steam, Water, Gases, Oils and Various Liquids in connection with the Processes of Manufacture.

Hydraulic Piping Systems of every Description.

## VALVES:

Accumulator	Gate
Aiken Hydraulic Operating	Globe, Angle and Cross
Aiken Stop	Hydraulic
Atmospheric Relief	Non-Return
Back Pressure	Plug
Blow-Off	Register
Butterfly	Relief
Check	Shock
Chronometer	Stuart Hydraulic Operat-
Critchlow Hydraulic Operat-	ing
ing	Tanner Hydraulic Oper-
Exhaust Relief	ating
Float	Throttle
Foot	Transfer

The above types of valves can be supplied for high and low pressures, in all sizes and for all services.

## SPECIAL VALVES:

We design all kinds of special valves and our experience is such that we feel safe in stating that no matter how peculiar your valve requirements may be, we can adapt or design something to suit the case.

## CASTINGS:

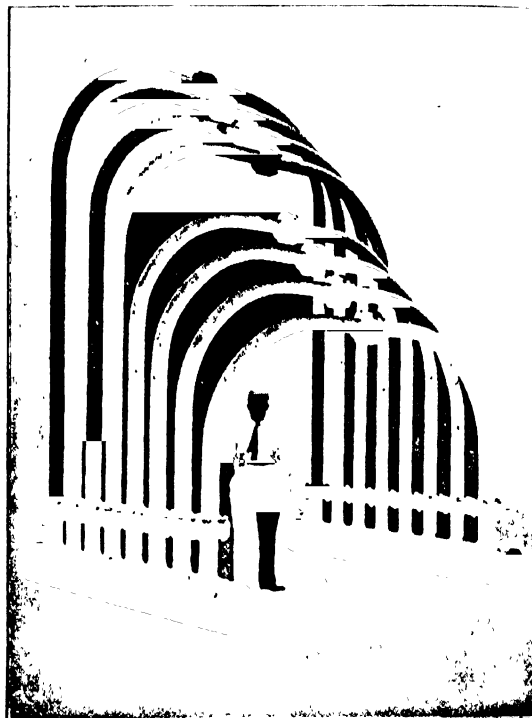
All kinds of special castings made and machined, including Furnace Castings, Pots, Retorts, Kettles, Valve Castings, Large Pipes and Fittings, etc.

## WELDED WORK:

Headers, Manifolds, Fittings, etc., made with our patented "Interlock Welded Necks," and "Atwood Line Welds."

CAST STEEL VALVES, FITTINGS, ETC., for use with Superheated Steam at all pressures.

Valve Fittings and Appliances, Piping, Steam Separators, Exhaust Heads, Etc.



The above illustration shows a type of welded construction often required for superheaters, coolers, heaters, condensers, etc.

## SERVICES:

Complete Piping Contracts executed for Chemical Works, Oil Refining Plants, Rubber Factories, Sugar Refineries, Soap Factories, Pulp and Paper Mills, Bleacheries and Textile Finishing Plants, Metallurgical Plants and all kinds of Industrial Undertakings.

The designing is done by experienced engineers; the manufacturing is in the hands of skilled workmen and is carried out in a large and most completely equipped plant, under competent supervision; the erection is in charge of capable engineers, under whom are a large staff of expert workmen.

When unusual difficulties are encountered in Power House or Process Piping, they are met with special valves, fittings or pipe bends. Tanner, Aiken or Critchlow Valves, Bottom Outlet Gate Valves, and many other special valves go to make up a complete line.

*Continued on Next Page*



**EQUIPMENT:**


Our plant consists of Iron Foundry, Steel Foundry, Pattern Foundry, Pattern Shop, Large Machine Shop, Cutting, Bending and Welding Shops, Pattern Houses, Warehouses, Power House, Engineering Dept., Etc.

Our machine tool equipment is thoroughly up-to-date. Most of our machines have been designed and built especially for our use.

**STANDARD SPECIFICATIONS:**

Our standard specifications have been adopted by leading high pressure concerns in the United States, a copy of which will be furnished on request.

**GUARANTEE:**

Our trade-mark  is on all goods made by us, and we believe in maintaining its reputation. We fully guarantee our goods for the service sold.

**CASTINGS:**

Wherever the Highest Grade of Grey Iron Semi-steel or Cast Steel Castings are required in the Chemical Industries, our plant can meet your needs, as we have excellent facilities for making and machining any such castings, no matter how large or intricate.

We do not make castings of special acid-proof irons, preferring to leave that branch to firms who specialize in it.

We will be pleased to have Chemical Engineers and Works Managers submit drawings and specifications to us for estimate. Frequently we can suggest important improvements and economies in equipment, as a result of our many years' experience in making large and intricate castings.



Flanged Cast Steel Cross with Side-outlet. We make all kinds of Flanged Special Cast Iron and Cast Steel Fittings. This illustration also is typical of the work we do in making and machining special castings

**GATE VALVES:**

Made in parallel and taper seat types. For exhaust, water, air and gas, the parallel seat type is recommended; while for medium and high pressure steam and hydraulic service, the taper seat type is recommended.

All types and sizes made either outside screw and yoke, or inside screw. Patterns are so arranged that valves can be made all iron or with bronze, monel or special mountings.

**MOTOR OPERATED GATE VALVES:**

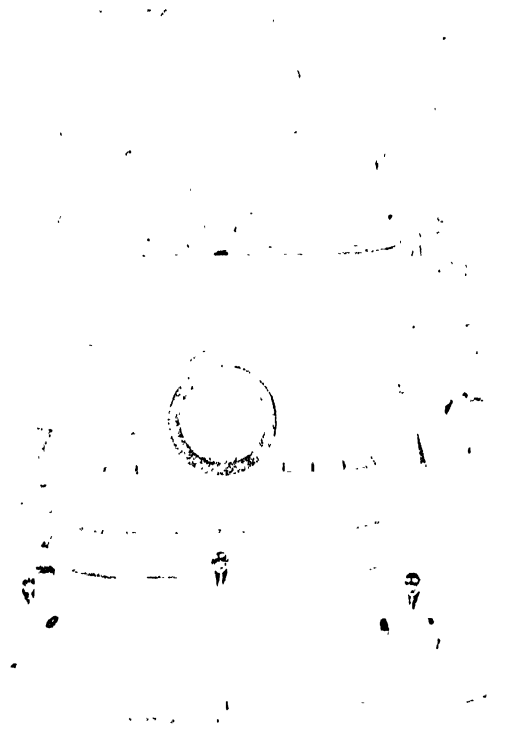
We have applied motor drives to gate valves for various classes of work, using either direct or alternating current. Gearing for our motor operated gate valves is designed to meet the requirements of strength and compactness. All gear teeth are cut. Motors fitted with graphite bearings which require no oiling or other attention.

Unless otherwise specified, Stuart limit controller is used exclusively for this service, consisting of two automatic circuit breakers, mechanically operated, and incased in a box mounted on the gate valve yoke out of reach of operator, thus making it impossible for him to interfere with their proper functioning.

Underwriters' specifications have been met in all our designs.

**CYLINDER OPERATED GATE VALVES:**

Built for any pressure or service. Motive power may be water, air or steam. If gaseous, as steam or air, placing the cylinder in a horizontal position is recommended. If, however, a vertical position can not be avoided, special attachments to meet conditions will be furnished.



10' 9" x 7' 6" Exhaust Connection Between 17000 K. W. Turbine and Condenser. Made for Jones & Laughlin Steel Co., Pittsburgh, Pa.

*Continued on Next Page*

**STEAM SEPARATORS:**

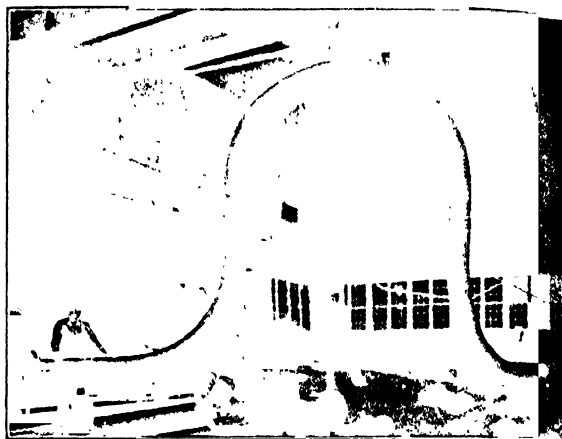
We build numerous types of steam separators, many of which are useful in connection with evaporating, drying and distilling equipment and other chemical plant purposes.

In these separators, every condition for good separation is met.

The standard horizontal, vertical and angle separators are made with cast iron bodies and wells.

Receiver type separators are made of semi-steel bodies and wrought steel wells. They are constructed upon the same general principles as the smaller separators.

The welded receiver type separators have necks welded in by the "interlock" method. This type is guaranteed to be absolutely tight and has proved its reliability under the most severe service.



Large Pipe Bend Containing 53 feet of 14-inch Pipe. The three lengths are connected by the "Atwood Line Weld." On account of its size it could not be shipped by rail. A river barge was used to convey it to the plant for which it was designed.

**STUART TWO-PRESSURE OPERATING VALVES:**

Used extensively by the largest rubber manufacturers for operating heaters and presses with high and low pressure water.

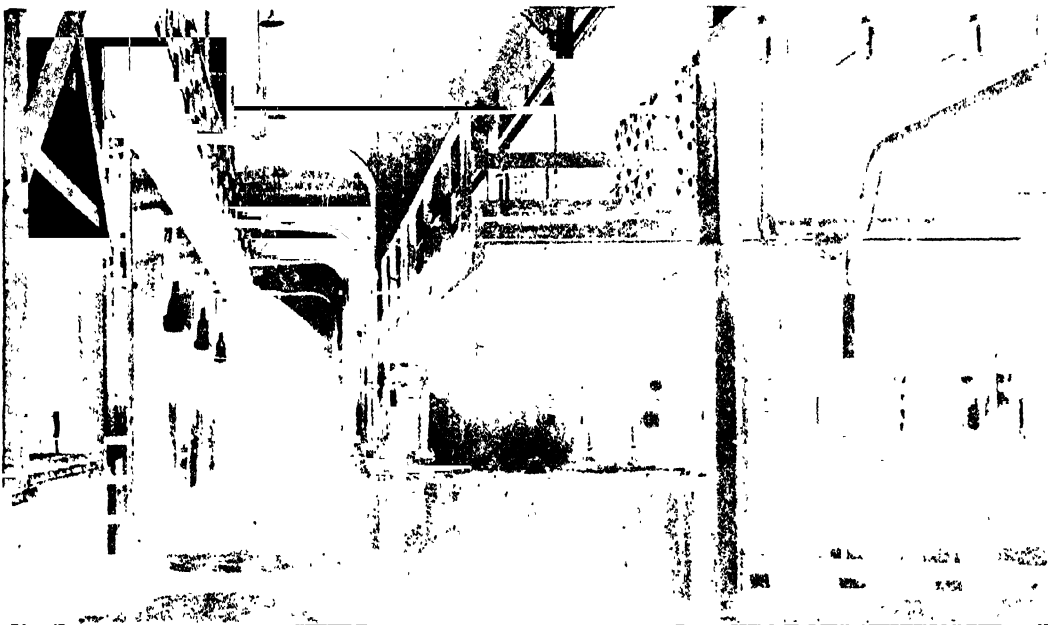
Supply of high pressure water is controlled automatically, and can not be turned on at the wrong time, nor can either the high or low pressure be turned into the waste.

Operation is very simple. Moving lever up or down will raise or lower the press, using low pressure water only. When moulds come against the head of heater, or top of press, high pressure water is automatically turned on to squeeze moulds and low pressure is automatically cut off. After curing process is complete, lever is pulled as far as possible, which shuts off high pressure water and waste water in press.

This valve saves high pressure water; increases output; is foolproof; saves money and annoyance.

**LITERATURE:**

We publish a Catalogue of over 650 pages, containing not only complete descriptions of all our lines of iron, steel and brass valves, fittings, etc., together with tables of dimensions, but also much useful mechanical engineering information. We will be pleased to consider requests for copies of this Catalogue from Chemical Engineers or Plant Managers, Etc.



Phosgene Plant of Edgewood Arsenal, Edgewood, Md.

# PITTSBURGH-DES MOINES STEEL COMPANY

Designers, Manufacturers and Erectors of Structural Steel and Steel Plate Work

808 CURRY BLDG.,

PITTSBURGH, PA.

## OFFICES

New York, N. Y., 208 Hudson Terminal  
Chicago, Ill., 1208 First Nat'l Bank Bldg  
San Francisco, Cal., 308 Rialto Bldg  
Detroit, Mich., 1108 Book Building



## OFFICES

Washington, D. C., 308 Munsey Bldg  
Dallas, Tex., 1208 Practitioner Bldg  
Des Moines, Iowa, 908 Tuttle Street  
Chatham, Ont., 208 Inches Ave

Pittsburgh, Pa.

Chatham, Ontario, Canada, 208 Inches Ave

Des Moines, Iowa

## PRODUCTS

Elevated Steel Tanks; Standpipes; and Steel Storage Tanks of all Types and Sizes, for Industrial, Municipal, and Railway Service.

Agitators; Bleachers; Condensers; Complete Oil Refineries; Cylindrical Containers for Storage, or for High or Low Pressures; Stills; Riveted Steel Pipe; Smoke Stacks; Mill Buildings and Manufacturing Plants; Store, Office, School and Church Buildings; Barges; Bins; Dredges; Coaling Stations; Wireless Towers; Bridges; Viaducts; Etc.

## ELEVATED STEEL TANKS

Furnished for Industrial, Municipal, and Railway Service, for Domestic Consumption, Fire Protection, Boiler Feed Water, Etc.

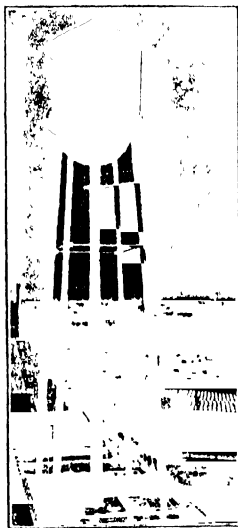
## LIST OF STANDARD DIMENSIONS

Rated Cap U. S. Gals.	Diam. D	Dist. b	Cylinder C
10,000	11'0"	4' 0"	10'11"
15,000	13'0"	6' 0"	10'11"
20,000	15'0"	5' 5"	10' 9"
25,000	15'0"	5' 4"	14' 7"
30,000	15'0"	6' 4"	15' 7"
35,000	17'0"	6' 8"	18' 5"
40,000	17'0"	6' 5"	15'11"
45,000	19'0"	8' 0"	17' 7"
50,000	19'0"	7' 3"	22' 6"
60,000	21'0"	7' 7"	21'10"
70,000	21'0"	8' 0"	22' 6"
75,000	21'0"	8'11"	24' 2"
80,000	21'0"	8' 0"	28' 4"
90,000	24'0"	8' 6"	22' 6"
100,000	24'0"	10' 5"	24' 2"
125,000	28'0"	10' 5"	35' 0"
150,000	32'0"	13'11"	33' 0"
200,000	32'0"	15' 6"	40' 3"

b = Net Depth Bottom

C = Height of Cylinder

h + C = Total Net Depth of Tank.



ELEVATED STEEL TANK

Please furnish the following information when requesting quotations on Elevated Steel Tanks:

1. Capacity in gallons.
2. Height of tower to lowest point of bottom.
3. If tank is used for sprinkler service, specify insurance organization having jurisdiction.
4. State which, if any, of the following are included in tank contract: a. Main Riser, b. Frost Casing, c. Tank Heater, d. Heater House, e. Underground Piping and Valves, f. Concrete Foundations.
5. The erecting conditions at site. Distance to nearest railroad siding. If erected on a building, give the number of stories and dimensions and spacing of the supporting columns.

## STANDARD STEEL OIL STORAGE TANK

## STANDARD STEEL OIL STORAGE TANKS

For Producers and Refiners, as well as for the Consumer of Fuel Oil in large quantities, we manufacture and erect standard tanks from 500 to 80,000 barrels capacity. We, of course, design, manufacture and erect special oil storage tanks of every description.

## OIL STORAGE TANKS, STANDARD SIZES

Tank No.	Capacity Bbls.	Capacity Gals.	Height	Diam.	Tank No.	Capacity Bbls.	Capacity Gals.	Height	Diam.
7	5,140	216,000	30'0"	35'0"	15	26,010	1,060,000	30'0"	77'0"
8	5,175	217,500	20'0"	43'0"	16	30,320	1,274,000	30'0"	85'0"
9	10,200	428,000	25'0"	51'0"	17	35,520	1,491,000	30'0"	92'0"
10	10,500	441,000	30'0"	50'0"	18	37,870	1,590,000	30'0"	95'0"
11	15,230	640,000	25'0"	66'0"	19	40,300	1,690,000	30'0"	98'0"
12	15,100	635,000	30'0"	60'0"	20	45,380	1,908,000	30'0"	104'0"
13	20,200	849,000	25'0"	78'0"	21	50,770	2,132,000	30'0"	110'0"
14	20,560	864,000	30'0"	70'0"	22	55,495	2,330,000	30'0"	115'0"

Tanks listed in bold face type are carried in stock, completely fabricated, ready for immediate shipment. Others can be fabricated quickly from plate stock.

All tanks are equipped with ladders or stairways, flanges, man-holes, swing pipes and winches, according to the specifications of the purchaser.

Detailed designs will be submitted upon request.

The supporting central roof may be either of steel, or of wood covered with No. 22 gauge sheets.

**Dome Roof Tanks**—Dome Roof Oil Storage Tanks have the advantage of eliminating roof supports within the tanks. They are, however, limited to a diameter of 43 feet.

Dome Roof Tanks are particularly adapted to use as "run down" tanks, or for divided storage. The roofs are caulked gas tight.

## DOMES ROOF TANKS—STANDARD SIZES

Tank No.	Capacity Bbls.	Capacity Gals.	Height	Diameter
1	560	23,500	10'0"	20'0"
2	1,118	47,000	20'0"	20'0"
3	2,185	91,800	25'0"	25'0"
4	2,520	105,800	20'0"	30'0"
5	3,140	131,800	25'0"	30'0"
6	4,050	170,000	25'0"	34'0"
7	5,140	216,000	30'0"	35'0"
8	5,175	217,500	20'0"	43'0"

Tanks listed in bold face type are carried in stock, completely fabricated, ready for immediate shipment. Others can be fabricated quickly from plate stock.

All tanks are equipped with ladders or stairways, flanges, man-holes, and other features according to the purchaser's requirements. Detailed designs will be furnished on request.



STEEL PRESSURE TANKS

## SERVICE

A letter addressed to our nearest branch office will put you in touch with our organization. With no obligation on your part, one of our engineers will gladly call upon you, determine your requirements, design your equipment if necessary, and quote prices either erected complete or f. o. b. our shops.

We have a large erecting department, which has erected Des Moines products in every part of the world.

# PNEUMATIC SCALE CORPORATION, LTD.

Automatic Machinery for Handling, Weighing, Packaging, Sealing and  
Labeling All Classes of Packaged Goods



Boston

New York

BRANCH OFFICES  
Chicago

London, England

Paris, France



MAIN OFFICE AND FACTORY  
NORFOLK DOWNS, MASSACHUSETTS

## PRODUCTS

Machinery for the packaging, weighing, sealing and labeling of all free flowing products such as:

Barley-Pearl	Poultry and Stock Remedies
Beans	
Borax	Powder, Baking
Bran	Powder, Face
Cereals	Powder, Jelly
Chocolate and Cocoa	Powder, Photo Fixing
Cocoanut	Powder, Talcum
Coffee	Powder, Tooth
Corn Meal	Rice
Cream of Tartar	Salt
Crumbs, Bread	Salt, Epsom
Dried Fruit and Vegetables	Seed, Bird
Drugs	Soap Chips
Farina	Soda, Baking
Flour	Soda, Bicarbonate
Gelatine	Soda, Sal
Hominy	Spaghetti
Infants' Food	Spices
Macaroni	Starch
Mustard	Sugar
Noodles	Sulphur
Peas, Split	Tapioca
	Tea
	Vermicelli

Also machines for labeling fibre cans, tins, etc., and the net weighing of material and capping of tins and cans.

## PNEUMATIC AUTOMATIC PACKAGING MACHINERY

Pneumatic Automatic Packaging Machinery makes possible the economical and efficient packaging of chemicals and food products in types of packages best adapted to the preservation and easy handling of the contents and at a cost much less than the actual cost of wrapping by clerks necessary in bulk selling.

Pneumatic Packaging Machinery saves an enormous waste due to inaccurate weighing and insures the material reaching the ultimate consumer clean and in the best condition and protects both the manufacturer and purchaser from substitution of inferior products.

In operation, Pneumatic Packaging Machinery is entirely automatic, each set of machines performs the work of twenty to forty hand operators. The illustration at the bottom of the page shows a complete set of Pneumatic Weighing and Packaging Machinery made up as follows:

The Pneumatic Carton Feeder opens and feeds the cartons to the bottom sealer. The bottom sealer seals

the bottom end, passes it on to the lining machine. The lining machine takes the paper from a roll, cuts it off and carries it into the carton on a forming block. The block is then withdrawn, leaving the lining perfectly made with all the seams securely sealed together and the whole lining closely adhering to all sides of the carton. From the lining machine a conveyor belt now carries the carton to the filling and weighing machine. From the first hopper of the filling and weighing machine a rough load is automatically weighed into the carton. The carton is then carried to the scale pan where a fine stream load from a second hopper gives it its true weight. From this second scale the carton passes along to the top sealing machine where the flaps are folded and securely sealed and the carton is delivered on a conveyor having a top and bottom pressure belt which operates on sealed package. The cartons travel to the end of the dryer belt where the packer places them in the shipping cases.

If an additional wrapper is desired on the carton such as a transparent or wax paper, this is accomplished by the dry wrapping machine which fits into the regular set.

For a positively airtight, weevil-proof and dust-proof package, the Pneutite Package and Tight-Wrapping Machines are recommended. These are described below.

## MACHINES FOR USE IN FILLING, WRAPPING AND LABELING FIBRE CANS, TINS, ETC.

The net weight packing machine for use in filling and weighing the contents of tin cans, etc., differs from the standard carton machinery in that the product is weighed into dummies so that the exact net weight is always secured without varying. The tin cans which are to receive the product are placed on a



COMPLETE PACKAGING EQUIPMENT

*Continued on Next Page*

conveyor belt by hand and carried along to the machine. As they pass under a dummy into which the material has been previously weighed, the bottom of the can and the material drops down into the can. The material passes from the machine over a set of tappers which tap the can and settle the contents.

The filled cans then travel along the receiving belt to the can capper into a position where dies close over the top of the can, holding it firmly in place while the cover, which is held in a pair of movable rollers, is carried down and pressed on the can.

The cans now travel along the receiving conveyor to the can labeling machine and come to rest against the package elevator. While the can is being lifted upward by the elevator it picks up the label which has been fed from the top of the stack at the rear end of the machine and carried through a tank of tempered water from the paste roll. In this operation the label is wrapped around the can and thoroughly pressed into place. From the can labeler, the can is carried to the Pneumatic dryer, capable of holding nine hundred cans. The label in drying is shrunk onto the can, thus closely adhering to the surface and making a perfectly tight seal between cover and can.

#### PNEUMATIC BAG FLOUR WEIGHERS

The Pneumatic Bag Flour Weighers embrace three types of machines. The first covers a range from two to seven pounds, the second a range from two to twelve pounds and the third machine covers a range from twelve to forty-nine pounds.

The general operation of weighing is practically the same with the bag machines as with the carton machines which have already been described above.

#### THE PNEUTITE PACKAGE AND THE TIGHT WRAPPING MACHINE

The type of package represented by the Pneumatic Scale Company's "Pneutite" has been thoroughly tested out by the United States Government Department of agriculture and found to be the one best solution for the protection of cereals from weevils. It is likewise absolutely dust-tight and air-tight and is especially valuable for use with powders, such as soap pow-

ders, which are inclined to sift out through the ends of an ordinary carton not thoroughly sealed.

The manufacturer finds that the "Pneutite" Package is actually weevil-proof and air-tight. It is more economical from all standpoints, compared with the cylindrical package. It permits the use of the least expensive cartons. It saves inward freight bills. It stores flat, and saves 90% of factory storage space. It packs closely in the container and thus saves 20% of outward shipping and storage expense for manufacturer, jobber and retailer. It may be made of absolutely pure stock, no oil, no treating solutions. It is exceptionally attractive and has a high display value. It is the manufacturers' insurance against spoiled goods and backfires from retailers and consumers. No opportunity for contamination from an adjacent weevil-infected package on grocery shelves is possible.

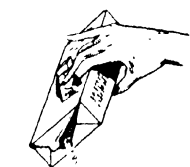
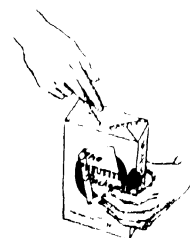
The housewife finds that this new package is handy for the new Lok-Top design makes pouring easy and the cover cannot come off. It is sanitary. The hinged cover seals the package after use dust-tight. It is her assurance that the contents come to her in a clean and wholesome condition, never infected with insects and she does not pay for an expensive package. It is also convenient to keep on her pantry shelf.

The Pneumatic Tight-Wrapping Machine illustrated below has made this tight-wrapped carton possible and economical to produce. The carton itself is made the same as an ordinary carton, but of much cheaper stock,—the cheapest grades of chip-board being equally satisfactory. Where the Lok-Top is desired, special dies must be used so that the use of a blunt knife on the top will reveal a hidden cover.

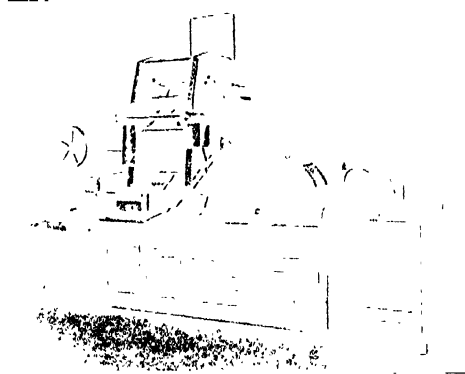
After packing, weighing, sealing in the usual manner, the Pneutite Package passes to the tight-wrapping machine which shrinks on a label closing every seam and edge of the box. This label being shrunk on is absolutely free from wrinkles and leaves no opening in which insects may lay their eggs. It seals the carton airtight and protects the contents against moisture and from sifting.

#### INFORMATION

Full information upon any of the machines manufactured by the Pneumatic Scale Corporation, Ltd., will be gladly sent upon application to the home office or to any of the branch offices given above.



SHOWING BASE OF  
OPENING THE PNEU-  
TITE PACKAGE



PNEUMATIC TIGHT WRAPPING MACHINE

# PNEUMERCATOR COMPANY, INC.

15 PARK ROW, NEW YORK, N. Y.

## PRODUCT AND SERVICE

### Pneumercator Gauges.

Indicate the depth and weight or volume, specific gravity or Baumé of any liquid, fluid or viscous, acid or alkaline, at any temperature.

## USE

### Tanks, Standpipes or Reservoirs.

A Pneumercator Gauge installed in any tank will provide a perpetual inventory of the liquid stored in the tank—an accurate check on liquid put in or withdrawn from the tank.

The gauge will operate with equal accuracy on tanks open to the atmosphere or under pressure or vacuum.

The accuracy is not affected by changes in temperature of the liquid in the tank or the temperature through which the pipe line connecting the tank to the indicating portion of the apparatus passes.

There are no floats, diaphragms or delicate mechanism of any kind to stick or get out of order.

## APPLICATION

Fuel oil tanks	Stillars
Lubricating oil tanks	Evaporators
Crude oil tanks	Automatic sprinkler tanks
Cutting oil tanks	Automobile tank trucks
Acid tanks	Reservoirs
Molasses tanks	Standpipes
Gasoline tanks	Flumes
Kerosene tanks	Tail races
Chemical storage tanks	Dams
Paint oil tanks	Water works
Light paint tanks	Tide fluctuations, etc.

## PRINCIPLE

The operation of all models of "Pneumercator" gauges is based on the maintenance of a true hydrostatic balance between the head of the liquid to be measured and a column of mercury or other indicating medium, the pressure being transmitted by air confined in a small connecting tube between the liquid and the gauge.

## CONSTRUCTION, FOUR ELEMENTS

1. A balance chamber or chambers, located in the liquid to be measured
2. A mercury or other gauge, located wherever it is desired to take readings
3. A hand pump or other source of compressed air
4. A control valve attached to the gauge and connected by small piping to the balance chamber and to the source of compressed air.

## QUOTATIONS

As each "Pneumercator" Gauge has to be made up for the specific purpose for which it is to be used, in order to advise and quote you intelligently it is necessary that we have the following information:

The dimensions of tank (or tanks)

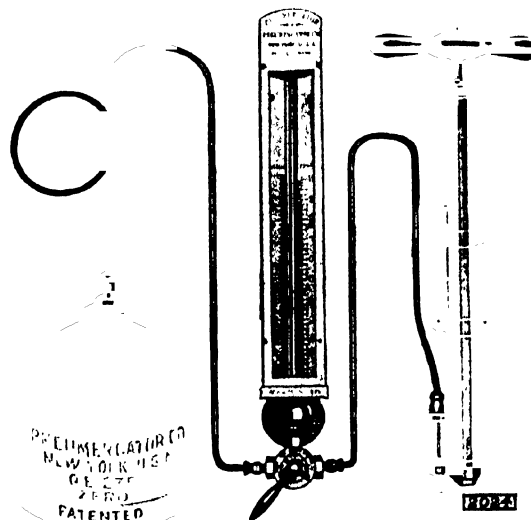
The distance from the tank to the point where the indicating section of the instrument is to be located

The nature and specific gravity of the liquid to be measured

Prices and full information will be promptly furnished on request.

## NOTICE

The coined word "Pneumercator" is registered as our trade-mark and attached to all instruments sold by us, our representatives or licensees under our patents throughout the world.



ESSENTIAL PARTS OF THE "PNEUMERCATOR" GAUGE  
PNEUMERCATOR GAUGE MODEL S. T. I.

This type is applicable to straight-sided tanks, containing liquids which have a constant specific gravity and which are to be measured in units of depth or volume. Also applicable to the straight-sided tank containing liquids of varying specific gravity where an accurate reading in weight is desired or where an approximate reading in depth or volume will suffice. For horizontal cylindrical tanks, whose contents have a varying specific gravity, it will give an approximate reading in units of depth, weight or volume.

The scales may be graduated in units of depth, weight or volume corresponding to each half inch of tank depth.

Types furnished in five sizes—16", 24", 32", 40" and 48", depending upon the depth of the tank and specific gravity of the contents.

## MODEL S. T. I. ELECTRICAL GAUGE

Is the Standard S. T. I. type fitted with a commercial annunciator which rings a bell and indicates visually whenever the tank content has reached a predetermined level.

Annunciator can be furnished for high or low level alarm, or both, and is actuated by the mercury. There are no electrical connections at the tank and thus fire hazard from short circuits is eliminated.



S. T. I. GAUGE

*Continued on Next Page*

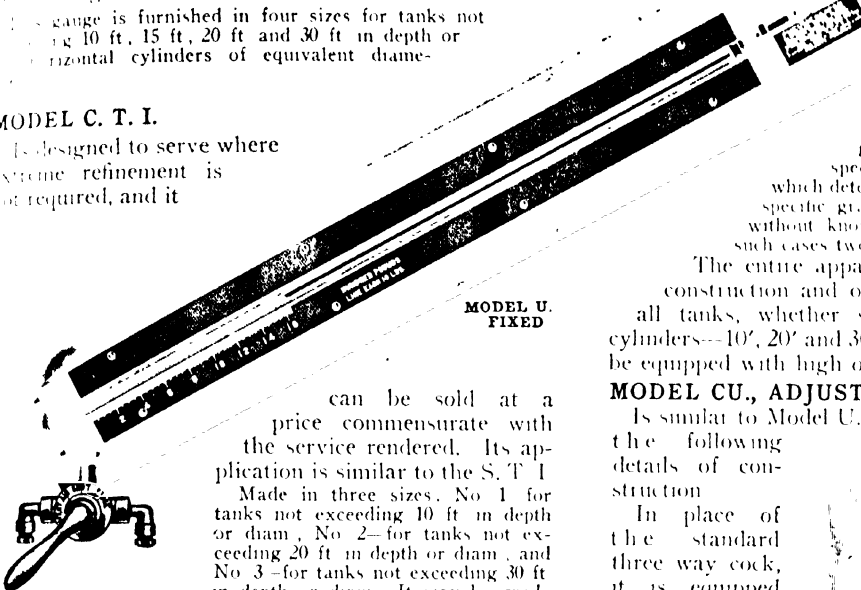
### MODEL U., FIXED

This model has the same application as the Model S. T. I. but is furnished for installations where a reading is required that is more accurate than that given by the S. T. I. model. The scales may have a mark for each one-quarter inch of tank depth. The scales may be graduated to read in units of weight or volume.

This gauge is furnished in four sizes for tanks not exceeding 10 ft., 15 ft., 20 ft. and 30 ft. in depth or horizontal cylinders of equivalent diameters.

### MODEL C. T. I.

It is designed to serve where extreme refinement is not required, and it



MODEL U. FIXED

can be sold at a price commensurate with the service rendered. Its application is similar to the S. T. I.

Made in three sizes, No. 1 for tanks not exceeding 10 ft. in depth or diam., No. 2—for tanks not exceeding 20 ft. in depth or diam., and No. 3—for tanks not exceeding 30 ft. in depth or diam. It may be graduated in units of depth, weight or volume with a mark for each one-half inch of tank depth.

Made in vertical direct reading type and furnished complete with hand air pump, mercury, mercury catcher and balance chamber.

### MODEL U., ADJUSTABLE

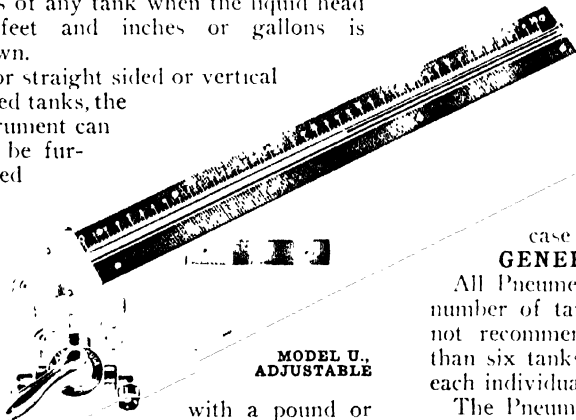
Model U., Adjustable Gauge is adjustable to varying specific gravities and when the movable indicating column is set with the pointer at the observed specific gravity or Baumé, will accurately indicate the tank contents in units of depth or volume, with a mark on the scale for each quarter inch of tank depth.

It will also indicate the average specific gravity or Baumé of the contents of any tank when the liquid head in feet and inches or gallons is known.

For straight sided or vertical walled tanks, the instrument can also be furnished



MODEL CTI



MODEL U. ADJUSTABLE

with a pound or ton scale, and will indicate the tank con-

tents in pounds or tons regardless of changes in the specific gravity. The pound or ton scale can not be furnished for horizontal cylindrical tanks.

**Application**—This equipment is applicable to conditions where at least one factor is known.

For cases where none of the factors are determinate, the Model U. Adjustable inclined gauge may be equipped with a specific gravity or Baumé finder, which determines any desired factor average specific gravity or Baumé depth or volume, without knowing any factor beforehand. In such cases two balance chambers are employed.

The entire apparatus is extremely simple in construction and operation. It is applicable to all tanks, whether straight sided or horizontal cylinders—10', 20' and 30' in diam. and depth. It may be equipped with high or low level alarm.

### MODEL CU., ADJUSTABLE

Is similar to Model U., Adjustable, differing only in the following details of construction.

In place of the standard three way cock, it is equipped with simple shut-off valve. The air pump is enclosed in the case, and the balance chamber is smaller than that of the standard type.

When a gauge is to be used on heavy liquids or long pipe lines, the standard



MODEL CU ADJUSTABLE

balance chamber is recommended.

**Application**—It is built in two sizes—the smaller type for service

on tanks not exceeding 6' in depth and diam. and the larger tanks not exceeding 12' in depth and diam.

The gauge is mounted in an aluminum case with hinged door which can be locked.

### GENERAL

All Pneumercator gauges may be manifolded to a number of tanks of the same size, although we do not recommend gauges to be manifolded to more than six tanks. In such installations, the content of each individual tank must be read at a time.

The Pneumercator System is Approved by Underwriters' Laboratories for Gauging Tanks Containing Hazardous Liquids.

# THE PORCELAIN ENAMEL & MFG. CO.

**PEMCO**

Eighth and O'Donnell Streets  
BALTIMORE, MARYLAND

**PEMCO**

## PRODUCTS

Porcelain Enamels for Cast Iron and Sheet Iron.

Installations for Enameling.

## GENERAL

The Porcelain Enamel & Mfg. Company is an organization of experienced and practical Enamellers.

The Company operates a large and successful Porcelain Enameling Plant in Baltimore for enameling products made of sheet iron and cast iron; it also operates successfully a large Porcelain Enameling Plant at Detroit, Michigan.

Besides these two plants the company has installed numerous Enameling Plants in many cities from ocean to ocean. Most of these plants are Porcelain Enameling Departments for manufacturing concerns; some are independent plants for the enameling of various specialties.



ENAMELING FURNACE

The company has manufactured for years in the Baltimore plant certain Vitreous Enamels, which it has been furnishing to all of the out-of-town plants. These enamels, known as "PEMCO ENAMELS," are recognized as the best product in this line.

The reputation of the company has been built up by, firstly—making Enamels that are not only much superior, but are in fact the only perfectly serviceable enamels for certain purposes; secondly—these enamels always run absolutely uniform, both in quality and shade, and the application is simple and economical; thirdly—the company, through a highly trained staff of service men, assists its customers to attain the highest efficiency in their Porcelain Enameling Departments.



SPRAYING OPERATION

Pemco Cast Iron Enamels are sprayed directly on to the cast iron, without any intermediate or primary coat, also called slush or ground coat, as is necessary with other enamels. Pemco cast iron enamels are fused in a very low temperature (1100 to 1300°F.), preventing warping even of delicate castings.

Pemco Sheet Iron Enamels are either dipped or sprayed on the articles to be enameled. They are burned or fused in temperatures from 2000 down to 1400°F.

Pemco Enamels do not merely lay on the surface, but sink in and fuse with the iron base.

There is no other enamel that adheres with the same tenacity, shines with the same brilliancy, or stands up as well under wear and use like PEMCO Enamel.

## THE PEMCO PROPOSITION

**Equipment**—The Pemco Organization will design your Porcelain Enameling Plant and furnish and install for you—ready to do business—a complete and efficient Enameling Equipment at a fixed price.

**Enamels**—Pemco will furnish you dependable Porcelain Enamels suited for your particular purpose. Pemco is the largest producer of Porcelain Enamels.

**Service**—Pemco Service in connection with Pemco Enamels is the feature which made the name "PEMCO" famous. Pemco has the long experience which helps our friends to do good porcelain enameling economically right from the start.

Pemco puts your plant in operation, shows you how to do the work right, and keeps a general supervision over your Enameling Department to insure maximum production.

**"PEMCO IS RELIABLE"**





Address  
1001 PASSAIC

## PORTABLE MACHINERY CO., INC.

Manufacturers of the Scoop Conveyor  
PASSAIC, N. J.



Western Union  
A. R. C. 10th Edition

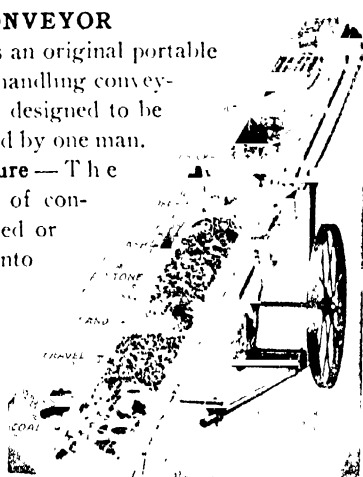
### PRODUCTS

#### Portable Belt Conveyors

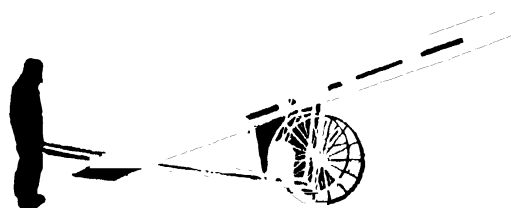
#### THE SCOOP CONVEYOR

This conveyor is an original portable belt type material handling conveyor with scoop end, designed to be moved and operated by one man.

**Exclusive Feature**—The scoop or feed end of conveyor can be pushed or completely buried into the material to be conveyed; the belt receiving its load over the scoop—a feature found in no other belt conveyor.



SHOWING EXAMPLES OF MATERIALS HANDLED



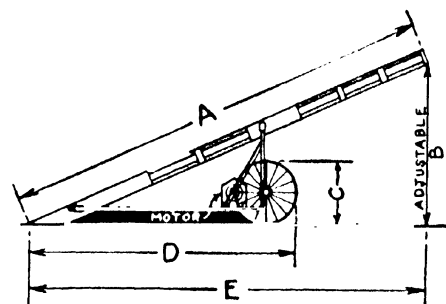
EASILY MOVED

**Guarantee**—We guarantee the carrying belt to handle at least 5000 tons of coal or 4000 tons of ashes or sand, making belt renewals cost less than one and one-half cents per ton handled; all other parts guaranteed against defects in workmanship and material for one year. There are now over 5000 Scoop Conveyors in use, many in the chemical industry. This we consider one of the best guarantees a purchaser can have that the machine is a profitable investment.



MATERIAL FED BY SCOOPING

**Dimensions**—See accompanying diagrams. The 14 ft size conveyor is suitable for loading and unloading



DETAILS AND DIMENSION DATA SCOOP CONVEYORS

Size	A	B	C	D	E	F	G
12" x 14'	14'	4' to 6'	12"	9'6"	12'5"	17"	13"
16" x 14'	14'	4' to 6'	12"	9'6"	12'5"	21"	17"
12" x 20'	20'	6' to 9'	12"	12'6"	18'3"	17"	13"
16" x 20'	20'	6' to 9'	12"	12'6"	18'3"	21"	17"
12" x 24'	24'	9' to 12'	12"	13'3"	22'6"	17"	13"
16" x 24'	24'	9' to 12'	12"	13'3"	22'6"	21"	17"
12" x 30'	30'	12' to 15'	12"	16'6"	27'0"	17"	13"
16" x 30'	30'	12' to 15'	12"	16'6"	27'0"	21"	17"

box cars or loading industrial cars and for general use in limited space.

Both the 20 ft. and the 24 ft. size are suitable for loading and unloading trucks or cars and for stacking materials. The size most suitable is governed by the height and reach required to meet operating conditions.

**Capacity**—One ton in one minute.

**Weight**—800 lbs. to 1600 lbs.

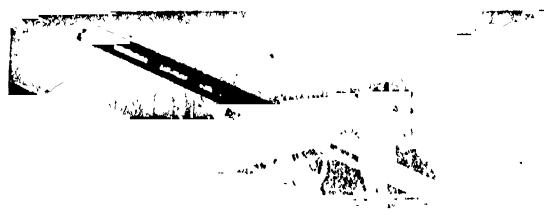
**Horse Power**—2 H. P. and 3 H. P.

**Power**—Machines furnished with either electric motor or gasoline engine. If customer supplies motor, the Company will provide motor support and drive from motor shaft. Drive reductions are carried in stock for any motor speed from 700 r.p.m. to 1800 r.p.m.

**When Writing or Ordering**—State operating conditions, kind of material to be handled, power available, where material is received, delivered, etc.



PILING WITH THREE SCOOP CONVEYORS



DIRECT FROM CAR HOPPER TO PILE

# POWER PIPING COMPANY

Industrial Piping Engineers

829 BEAVER AVE., PITTSBURGH, PA.

## BRANCHES

Cleveland, O., Power Piping Co., Chicago, Ill., Power Piping Co.,  
30 Euclid Arcade Annex 1107 Peoples Life Bldg

New York, N. Y., C. W. Bergen & Washington, D. C., H. A. G.  
Co., 256 Broadway C. H. Young 210 Albee B.

## REPRESENTATIVES

C. H. Young 210 Albee B.

## PRODUCTS

Piping Systems complete in every detail, including design, construction, and erection, for every industrial purpose.

Acetylene welding in all its branches.

We have constructed a great variety of special welded equipment—heaters, superheaters, coolers, condensers, piping, etc.—for oil refiners and plants employing special chemical processes.

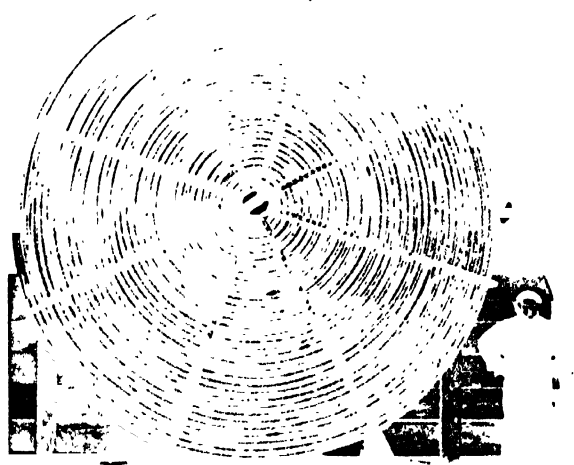
## FACILITIES AND SERVICES

The requirements of the present day for piping systems are extensive and vitally important to economical operations on large scale industrial production.

We feel that the examples of our work shown in these pages will enable prospective buyers to see that our organization is equipped in every way to build piping systems no matter how large or how complicated.

## COMPLETE PIPE SYSTEMS

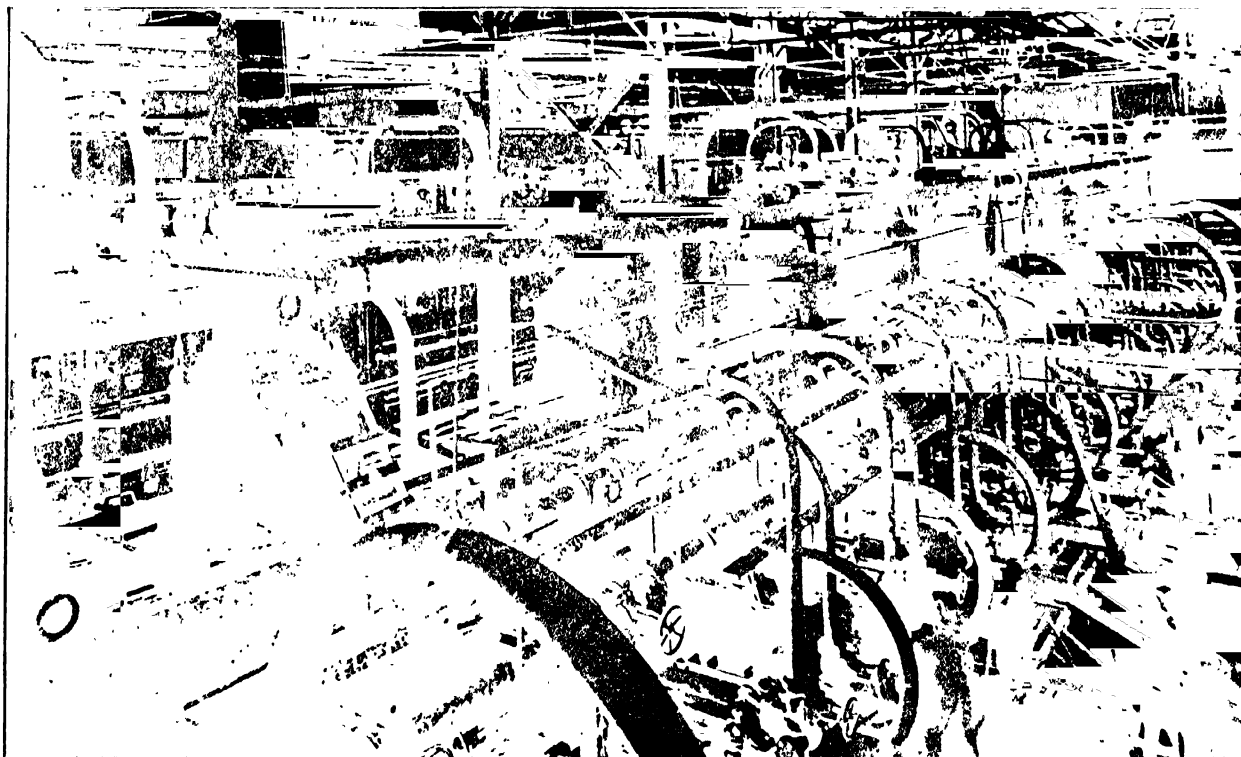
The two illustrations shown here are examples of some of the large piping systems we are equipped to build. Note the many different angles of the pipe bends, and the large pipe diameters. These examples of our work show the extent of our facilities for the most complicated piping installations.



HEATING COIL FOR TREATING LUBRICATING GREASE IN PETROLEUM REFINERY

## HEATING AND COOLING COILS

We build coils for process work especially suitable for chemical plant requirements because they are capable of giving good service under the severe conditions encountered. Perfect bends, welds, and flange connections at inlet and outlet are essential. The unusually large coil shown here will serve to illustrate how well fitted we are to build this equipment.



PIPING INSTALLATION IN LARGE CHEMICAL PLANT

*Continued on Next Page*

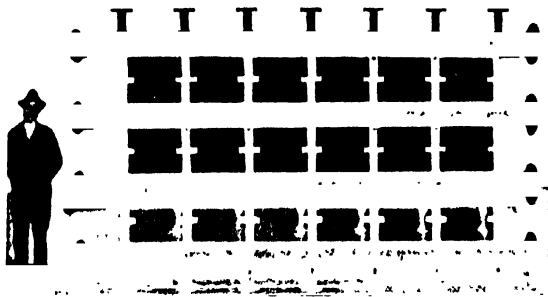
**WELDED EQUIPMENT**

Have a department especially devoted to the building of welded equipment. The superiority of welded apparatus is recognized by operating engi-

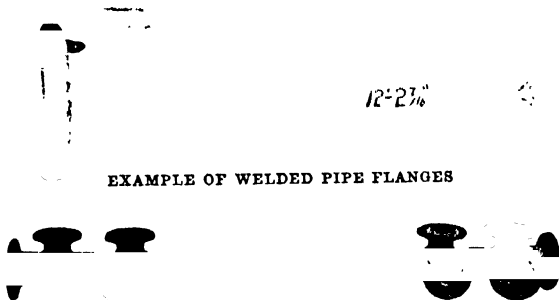


WELDED HIGH PRESSURE RECEIVER

WELDED HIGH PRESSURE RECEIVER WITH FOUR OPENINGS



MANIFOLDS FOR SPRAY SYSTEM ASSEMBLED TO ILLUSTRATE UNIFORMITY OF EACH UNIT



EXAMPLE OF WELDED PIPE FLANGES



WELDED HEADER ENTIRELY FROM PIPE

neers with the result that the demand is constantly increasing. The increased length of service of steel welded pipe, headers, manifolds, fittings, etc., wherever high pressures are necessary will result in great economy in process work. Loss of valuable liquors from leaks, danger of explosion under high pressure of non-welded apparatus, etc., should all be considered

by engineers when they are designing new installations, or making additions to present equipment.

The illustrations shown here are some examples of welded equipment we have built. From the size of some of this work, an idea may be had of our facilities as well as our ability to serve the largest industrial corporations.



PIPE TESTED TO 10,000 LBS. PER SQ. IN. FOR HYDRAULIC WORK

**HYDRAULIC PIPING**

We design and build in our own shops hydraulic power piping, for industrial operations in metallurgical plants, rubber factories, cottonseed and other vegetable oil plants, petroleum refineries, soap works, etc.

All hydraulic piping, flanges and fittings are tested by us before shipment.

**STEEL WELDED PIPE AND APPARATUS IN THE CHEMICAL INDUSTRIES**

Piping systems, whether for steam, water, or other liquids or gases, should be given the greatest possible consideration in the design of a large industrial chemical plant.

Usually it is advisable to intrust this work to a concern making a specialty of it and capable of co-operating with the chemical engineers in general charge of the proposition in an intelligent and useful manner.

Our experience is such that we are not only able to fabricate anything that may be required in this line, but also to make useful suggestions.

Engineers contemplating new installations, or additions or alterations to present equipment, should consult us on their piping problems, process pipe lines, and high pressure equipment, as the experience of our organization of engineers and designers is at their service.



VAN STONE CROSS-OVER BEND AND HEADER

# POWER SPECIALTY COMPANY

Manufacturers of Foster Superheaters for  
Steam, Air, Oil and Chemical Gases

111 BROADWAY, NEW YORK, N. Y.

CHICAGO  
Harris Trust Building

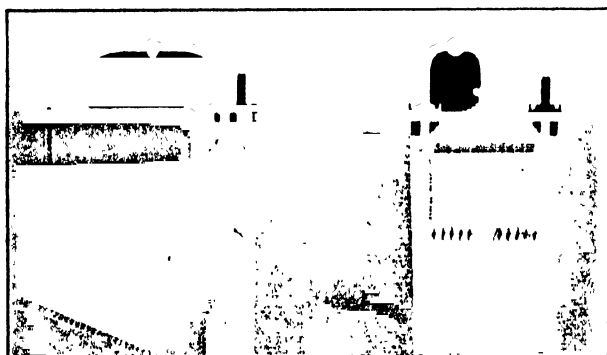
BOSTON  
50 Congress Street

PHILADELPHIA  
Land Title Building

PITTSBURGH  
Park Building

SAN FRANCISCO  
Balboa Building

**PRODUCTS:** Superheaters designed for installation in any type of Water Tube or Fire Tube Boiler; also Direct Fired Superheaters in all sizes for Special High Temperature Work; Portable Superheaters for Laboratories, Oil Heaters, Air Heaters and Special Equipment for Heating Various Gases.



**FOSTER SUPERHEATER IN HORIZONTAL RETURN TUBULAR BOILER**

Installation may be made in old or new boilers and steam connections arranged for either side. The superheater is suspended from overhead supports resting on the walls of the setting.

## SPECIAL PROCESS WORK:

Superheated steam is used successfully at the present time in many chemical processes, among which might be mentioned: Petroleum distillation; the refining of cotton seed oil; glycerine stills, sulphite, soda and sulphate digesters in paper pulp manufacture; sulphuric acid plants; water gas plants; soap works; aniline and color works; paint works; manufacture of butter substitutes and many others.

## SOME USERS:

Among some of the well known companies using our equipment might be mentioned:

General Chemical Co.	E. I. DuPont de Nemours & Co.
Semet Solvay Co.	
National Aniline & Chemical Co.	Armour & Company
Benzol Products Co.	Dow Chemical Co.
Schoellkopf Aniline & Chemical Co.	Swift & Company
Sherwin-Williams Co.	Nucora Butter Co.
Calco Chemical Co.	North American Chemical & Co.
	Merrimac Chemical Co.

## SPECIAL ENGINEERING SERVICE:

The wide experience our Company has had in the development of superheaters and all kinds of special heating apparatus for chemical uses offers unusual advantages to any one interested in solving problems of this kind, and the services of our engineering department are always available to companies desiring special information. Very often experience gained in some kindred industry may indicate the best manner in which to solve a new problem.

## RESEARCH WORK:

The Foster Portable superheater is especially valuable for use in the development of new processes or the improvement of existing methods. Superheaters of this type designed to heat steam, oil, air or other gases are built in a number of convenient sizes for laboratory use.



**FOSTER PORTABLE SUPERHEATER FOR STEAM, AIR OR GASES**

Suitable for experimental purposes or field work. Extensively used for heating air used in drilling or hoisting and may be fired with oil, coal, coke or gas.

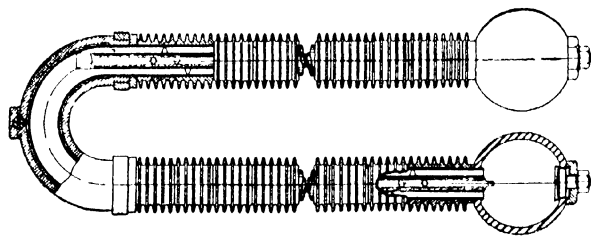
## STANDARD SIZES OF PORTABLES

Size	Weight Lbs	Price	Width	Height	Steam Pipe	Smoke Pipe
16	1950		2'-0"	3'-0"	3"	7"
48	3860		3'-8"	5'-0"	4"	10"
72	4720		3'-8"	5'-7"	4"	10"

Size	Air Heating Capacity in Cubic Feet per Minute		Steam Superheating Capacity 10 lbs. per hr. at 100 lb. Gauge	
	60° F. to 160° F.	60° F. to 200° F.	100° Superheat	200° Superheat
16	660	345	700	380
48	2000	950	2100	1140
72	3000	1400	3150	1710

## DESCRIPTION:

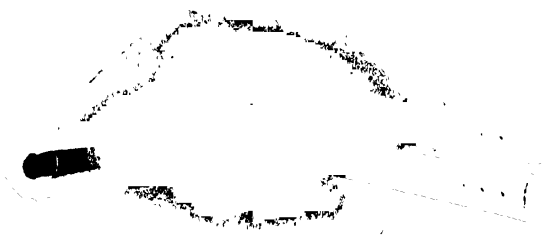
The heating surface of all types of Foster superheaters is formed of cold drawn seamless tubing, the outside surface of which is completely covered with a



**CONSTRUCTION DETAIL OF U-BEND ELEMENT**

*Continued on Next Page*

of cast iron rings, tightly fitted to the steel tube, forming an iron surface forming an extended surface for reflection and storage of heat and at the same time protecting the steel tubes from direct contact with the boiler tubes. The tubes or elements are expanded into



#### METHOD OF ASSEMBLING U-BEND ELEMENT AND CONNECTING HEADERS

wrought steel manifolds or headers. An inner tube or core is centered within the straight portion of each superheater tube, thus forcing the steam to flow through the annular space as a film directly in contact with the hot outside heating surface. Hand hold plugs are located opposite every tube end, giving direct access to every expanded joint and the interior of the superheater.

#### ATTACHED SUPERHEATERS:

The Foster Superheater is designed for erection within the setting of any of the standard types of water tube or fire tube boilers. Such installations require practically no changes in the setting of the boilers and therefore can be applied in any existing boiler without difficulty as well as to new installations. When installed within the boiler any degree of superheat, up to 200° Fahrenheit, can be obtained and the superheat will be practically constant on boiler loads from full load rating to any overload, rising slightly on over-



#### FOSTER SEPARATELY FIRED SUPERHEATER

The furnace may be arranged for fuel oil, coal or gas. High pressure or exhaust steam, air, petroleum, sulphurous oxide, etc., may be heated to any temperature up to 1000° F.

loads. When the boiler runs at less than full load rating the superheat will fall off, somewhat.

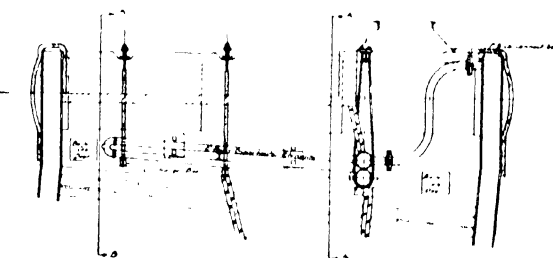
On processes where very constant temperatures are required or a regulation of temperature at various times during a process or when very high temperatures are desired the direct fired type of superheater, installed in brick setting independent of the boilers, is most desirable.

#### DIRECT FIRED SUPERHEATERS:

Foster superheaters of this type are designed for installation in brick setting arranged for firing with coal, oil or gas fuel or with waste heat from various processes.

Such superheaters can be designed to give any desired temperature to steam at any pressure and operated so that any degree of superheat up to the maximum for which the superheater is designed may be obtained. This is very desirable in many chemical plant installations where different temperatures may be desired at different times during a process.

Foster superheaters of this type are designed to raise steam to any temperature up to 850 to 950° Fahrenheit. Even higher temperature may be obtained if necessary.



FOSTER SUPERHEATER INSTALLED IN WATER TUBE BOILER

#### AIR, OIL AND GAS HEATERS:

Heaters for these purposes are built similar to steam superheaters of the direct fired type using the Foster patented protected type of elements. Special equipment of this type has been developed for use in many chemical processes requiring higher temperature effects than are possible with saturated steam and where high pressure steam is undesirable or dangerous to use. Many developments of this kind are possible as a means of doing away with the use of direct firing of kettles or tanks where the fire risk is considerable.

#### SUPERHEATED STEAM IN POWER PLANTS:

The advantages due to the use of superheat for engines, turbines, and pumps in the power plant are thoroughly appreciated, the use of superheat being almost universal at the present time. Material savings of steam and fuel may be thus obtained by the use of a moderate degree of superheat.

#### LITERATURE:

Our catalog describing the construction of the Foster superheater in detail will be sent on request, and information regarding any special equipment will be supplied by any of our offices.

# THE POWERS REGULATOR CO.

965 Architects Bldg.  
NEW YORK

2726 Greenview Ave.  
CHICAGO

576 Boston Wharf Bldg.  
BOSTON

The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

## PRODUCTS

**Temperature Controlling Specialties and Appliances for the Automatic Regulation of Heating and Cooling Mediums of all kinds, and for general purposes.**

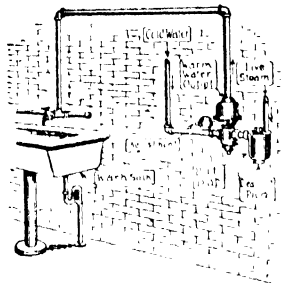
The possibilities in automatic temperature control should be carefully studied. Increasing production costs necessitate close scrutiny of operating conditions. Powers Regulators will eliminate unseen daily losses that make an astonishing total.

Absolute reliability is of paramount importance in this work. The adoption of Powers equipment by the leaders of American industry (see appended partial list of users) is strong indication of the prestige that our apparatus has acquired. The regulators illustrated on this page are but a part of the extensive Powers Line, and the "Users" but a small fraction of our complete list of customers.

## SOME USERS

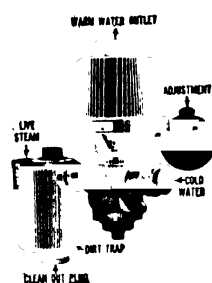
Hendee Mfg. Co., Springfield, Mass.  
Cranes Co., Chicago  
Cleveland Telephone Co., Cleveland  
Dodge Bros., Detroit  
Holtzer Cabot Electric Co., Roxbury, Mass.  
Selig Polyscope Co., Chicago  
American Tobacco Co., Chicago  
Curtis Door & Sash Co., Chicago  
Orinoka Mills, Philadelphia  
American Rubber Co., East Cambridge, Mass.  
B. Heller & Co., Chicago  
Wyman Gordon Co., Worcester, Mass.  
DeLaval Separator Co., Poughkeepsie, N. Y.  
Epson Nut Co., Cleveland  
Timken Detroit Axle Co., Detroit  
Aberthaw Construction Co., Boston  
Julius Kayser & Co., Brooklyn, N. Y.  
Willys Overland Co., Toledo  
Chicago Telephone Co., Chicago  
Boston Woven Hose & Rubber Co., East Cambridge, Mass.  
B. F. Goodrich Co., Akron, Ohio  
New Departure Mfg. Co., Bristol, Conn.  
Eastman Kodak Co., Rochester, N. Y.  
Geo. E. Keith Co., Brockton, Mass.  
Morgan Construction Co., Worcester, Mass.  
J. P. Prowett & Sons, Webster, Mass.  
Independent Brewing Ass'n., Chicago  
Livingston Baking Co., Chicago  
S. A. Maxwell Co., Chicago  
Reid Murdock & Co., Chicago  
Goodyear Tire & Rubber Co., Akron, O.  
Firestone Tire & Rubber Co., Akron, O.  
National Artificial Silk Co., Cleveland, Ind.  
Boston Woven Hose & Rubber Co., Cambridge, Mass.  
Winchester Repeating Arms Co., New Haven, Conn.  
Eli Lilly & Co., Indianapolis  
Edison Electric Co., Orange, N. J.  
Walter Baker & Co., Newton, Mass.  
Hallett & Davis Piano Co., Neponset, Mass.  
Sears Roebuck & Co., Chicago  
Harrison Walther Refractories Co., Chester, Pa.  
Robinson Clay Products Co., Parlat, O.  
Fisk Rubber Co., Chippewa Falls  
New England Westinghouse Co., Springfield, Mass.  
Keystone Leather Co., Camden, N. J.  
Wilmington Leather Co., Wilmington, Del.  
National Calfskin Co., Lawrence, Mass.  
Pierce Arrow Motor Car Co., Buffalo  
Brunswick Balke Collender Co., Muskegon, Mich.  
Lyon & Healy, Chicago  
Faultless Rubber Co., Ashland, O.  
Barney & Smith Car Co., Dayton, O.  
U. S. Rubber Co., Hartford, Conn.  
E. I. DuPont De Nemours & Co., Wilmington, Del.  
Greiss Pfeiffer Co., Chicago  
Wilder Tanning Co., Waukegan, Ill.  
Benzol Products Co., Marcus Hook, Pa.

## THERMOSTATIC STEAM AND WATER MIXER



TYPICAL INSTALLATION IN WORKMEN'S WASH SINKS

For workmen's wash sinks, etc., in factories, mines, industrial plants. Safe against scalding. Insures properly heated water for workmen's washup at minimum cost for equipment and operation. Ask for Bulletin 137.



POWERS THERMOSTATIC MIXER

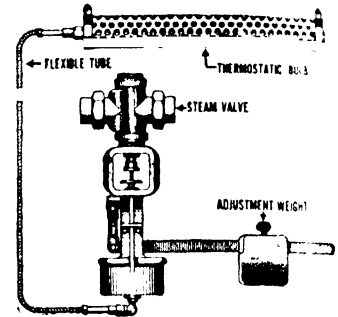
## AIR TEMPERATURE CONTROL

For dry kilns, warming ovens, cooling rooms, dry rooms, varnish rooms, etc., our No. 15 Regulator gives dependable uniformity of temperature. Entirely self-contained, and adapted to a great variety of processes.

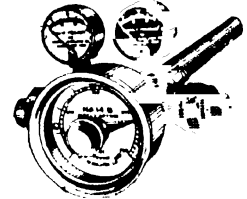
Personal attention is unreliable and expensive, and should be replaced by Automatic Thermostatic Regulation wherever possible. Ask for Bulletin 138.

Our No. 14B Regulator is of the compressed air operated type—very sensitive and effective. Used in air conditioning and for control of sterilizers, ovens, dryers, cold storage rooms, etc.

With this may be used our all-metal diaphragm mounted valves adapted to the control of steam, gas, or liquids. Ask for Bulletin 132.

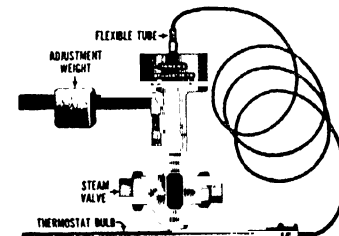


POWERS REGULATOR NO. 15

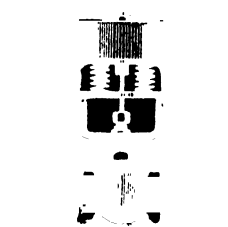


POWERS REGULATOR NO. 14B

## LIQUID TEMPERATURE CONTROL



POWERS REGULATOR NO. 11

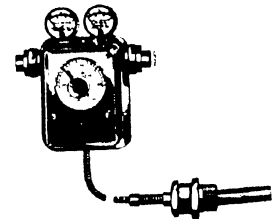


POWERS ALL METAL MOUNTED VALVE

Our No. 11 is highly effective for the control of temperatures of liquids in tanks, kettles, vats, etc. Especially practical in those industries which involve washing and dyeing processes, bleaching equipment, cookers, acid baths, chemical treatments, etc., etc.

Entirely self-contained, requiring no air or water pressure for its operation. Ask for Bulletin 129.

Our No. 21 is a compressed air operated regulator with flexible extension bulb, for use with diaphragm valves and motors, to control heating and cooling mediums. Particularly effective where gas is the heating medium. Its wide range (0° to 1000° F.) adapts it especially to core ovens, soft metal furnaces, etc. Ask for Bulletin 147.



POWERS REGULATOR NO. 21

# POWHATAN MINING COMPANY

Cable Address "POWMINCO"

WOODLAWN, BALTIMORE, MD.

## PRODUCTS

Powminco Asbestos



Trade-Mark

## USES

### Technical

Laboratory  
Filtration

### Commercial

Filtering Acids, Chemicals, etc.  
Platinizing Asbestos as used in the contact process  
of a sulphuric acid plant.

## POWMINCO ASBESTOS

Powminco Asbestos is fibreized; free from gangue, incompletely shredded mineral and other impurities.

We can furnish most any length of fibre for special laboratory purposes; packing combustion tubes, trains, etc.

**Powminco** Asbestos has been adapted to many special uses, outside its regular field. Submit us your problems, we may be able to adapt **Powminco** to your particular requirement.



PURE ACTINOLITE ASBESTOS FIBRE

## SAMPLES

Our Technical Department will be very glad to submit samples, prices, together with descriptive literature, under no obligation whatsoever.

## SERVICES

No obligation. Our Testing Laboratory will be glad to experiment in order to determine our product's availability for any specified use. Write our Experimental Laboratory regarding your particular problem.

# PRECISION INSTRUMENT COMPANY

Recording and Indicating Instruments for Power and Gas Plants

FACTORY AND MAIN OFFICE

21 Halsey Street

NEWARK, N. J.

BRANCH OFFICE Detroit, Mich

## PRODUCTS

Indicating and Recording Gauges for Vacuum and Pressure, with scales in inches, pounds and millimeters of water, mercury and kerosene; Combined Recording and Indicating Gauges; Differential Draft Gauges; Hydro-Gauges; Automatic CO<sub>2</sub> Recorders; SO<sub>2</sub> Recorders; Hand Orsats or Flue Gas Analyzers; Coal Calorimeters; Micrometer Level Gauges; Recording Gas Calographs; Specific Gravity Recorders; Laboratory Test Meters.

Also manufacturers of Gas Collectors; Pitot Tubes; Venturi Tubes; Chemical Glassware.

## GAUGES

**Precision 2-in-1 Gauges**—For use in natural draft boilers, showing the draft in the combustion chamber and the last pass or any other points of draft desired. Furnished in indicating or 24-hour recording types, in any range to meet requirements. Patented.



PRECISION 2-IN-1  
INDICATING GAUGE



PRECISION 2-IN-1  
RECORDING GAUGE

**Precision 3-in-1 Gauges**—For use with stokers with forced draft and are installed to enable the operating man to see at a glance the three vital points of draft in a boiler. Furnished in indicating or 24-hour recording types. Patented.



PRECISION 3-IN-1  
INDICATING  
GAUGE



PRECISION 3-IN-1  
RECORDING GAUGE

**Precision 4-in-1 Gauges**—For use in installations where an economizer is installed or with stokers having 2 compartments below the grates. All ranges to meet requirements. Patented.



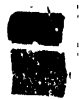
PRECISION 4-IN-1  
INDICATING  
GAUGE

**Precision 5-in-1 Gauges**—For indicating the drafts in boilers where Cox or Harrington stokers are installed, enabling the fireman to read pressure and drafts at every part of the boiler. Dead beat construction under Precision patents.



PRECISION 5-IN-1  
INDICATING  
GAUGE

**Precision 60-day Tape Gauges**—Supplied in ranges from 2-in. vacuum to any desired pressure. Dead beat construction. Used to record drafts at the boiler or steam pressure.



PRECISION  
60-DAY TAPE  
GAUGE

**Precision Single Indicating Gauges**—For indicating vacuums or pressures. Rugged in construction and of the well-known Precision dead beat type.

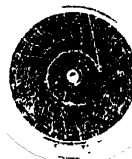
Supplied in inches, pounds and millimeters of water, mercury or kerosene.

**Precision Hydro-Gauges**—For gas plants are guaranteed accurate and reliable.

For recording pressure in gas plants, coke ovens, etc. Guaranteed accurate and reliable. Supplied as above in water, mercury or kerosene.



PRECISION SINGLE GAUGE



PRECISION 24-  
HOUR RECORD-  
ING GAUGE

**Precision 24-hour Recording Gauges**—Guaranteed accurate. Dead beat construction. Ranges, 1 in. to 500 lbs. vacuum and pressure. In feet head for liquid levels. For coke oven use, can be supplied in millimeters of kerosene.

*Continued on Next Page*



**CO<sub>2</sub> RECORDERS**

Automatically analyze flue gases and record on a 24-hour or 60-day chart. True orsat in principle. Reagent used is potassium hydroxide.

Simple in construction, accurate to .5 of 1% CO<sub>2</sub>. Standard range, 0 to 20% CO<sub>2</sub>. Also supplied in 0 to 10% for producer gas; 0 to 50% for blast furnaces and lime and cement kilns; 65% to 100% for soda ash manufacturers.

CO<sub>2</sub> RECORDER**SO<sub>2</sub> RECORDERS**

Of the same general principle as CO<sub>2</sub> recorders, but adapted to analyze sulphur dioxide.

**STANDARD ORSAT**

Orsats in 1, 2, 3 and 4 tubes. Burettes graduated for 50 cc. or 100 cc. All metal and glass construction. Analyze for CO<sub>2</sub>, CO, O and H. Orsats for other readings can be supplied to specifications.

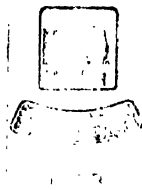
PRECISION 100 CC  
STANDARD ORSAT**COAL CALORIMETERS**

This company has been identified with the manufacture and sale of coal calorimeters for a number of years, and has developed simple and reliable patented instruments for determining the heating value of coal.

These instruments afford coal buyers the financial advantage of buying coal on a heating value basis from tests of coal offered for sale.

PRECISION COAL  
CALORIMETER**COMBINED INDICATING AND RECORDING GAUGES**

Give the indication at a glance, also the permanent record of the condition on a 60-day tape chart. Made for either vacuum or pressure, direct reading or differential. Supplied with rewinding device for used chart, if desired. Case is of all-metal construction, black enamel. Bronze front furnished at extra cost.

COMBINED INDICATING AND  
RECORDING GAUGE**MICROMETER LEVEL GAUGES (SINGLE AND DOUBLE)**

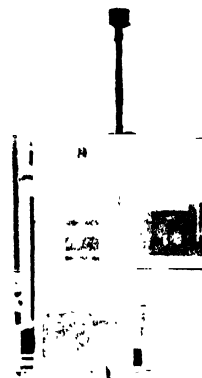
Combine rapid and accurate calibration with low maintenance and minimum chance of breakage. Absolutely no strain

placed on the glass. Connection between glass and metal is through a simple seal.

PRECISION DOUBLE MICROMETER  
LEVEL GAUGE**RECORDING CALOR-GRAPHS**

For recording on a 60-day chart the British thermal units of artificial, natural or producer gas. Automatically compensate for variations in temperature, specific gravity and pressure.

Accurate and reliable. Simple in construction and give permanent record.

PRECISION RECORDING  
CALOROGRAPH**SPECIFIC GRAVITY RECORDERS**

These instruments automatically record specific gravity of gases and are applicable for natural gas, producer gas, artificial gas and in the oil and gasoline fields.

They are accurate, simple and reliable.

24-hour disc or tape types.

PRECISION SPECIFIC  
GRAVITY RECORDER**LABORATORY TEST METERS**

Made in one general type as illustrated, with all brass construction to resist corrosion. Capacity, 1/10 of 1 cu. ft. per revolution. Read fractional quantities direct.

New features. Send for bulletin.

LABORATORY TEST  
METER**SOME USERS OF PRECISION GAUGES**

Alabama Power Co., Benoit, Ala.  
American Gas & Electric Co., Wellsburg, W. Va.  
American Railways Co., Philadelphia, Pa.  
American Smelting & Refining Co., Maurer, N. J.  
Baltimore & Ohio Railroad, Baltimore, Md.  
Barrett Company, New York, N. Y.  
Benzol Products Co., Marcus Hook, Pa.  
B. F. Goodrich Co., Akron, Ohio.  
Brunner, Mond Canada, Ltd., Amhurstburg, Canada.  
B. T. Habbitt Co., New York, N. Y.  
Canadian Salt Company, Windsor, Ontario.  
Columbia Chemical Co., Barborton, Ohio.  
Connecticut Light & Power Co., Waterbury, Conn.  
Consolidated Gas & Electric Light & Power Co., Baltimore, Md.  
Diamond Alkali Co., Painesville, Ohio.  
Edison Electric Illuminating Co., Boston, Mass.  
Endicott, Johnson Co., Endicott, N. Y.  
General Chemical Company, New York, N. Y.  
Grasselli Chemical Co., Cleveland, Ohio.  
Huron Portland Cement Co., Detroit, Mich.  
Interborough Rapid Transit Co., New York, N. Y.  
Lehigh Valley Transit Co., Allentown, Pa.  
Linde Air Products Co., New York, N. Y.  
Little Rock Railway & Electric Co., Little Rock, Ark.  
Louisville Gas & Electric Co., Louisville, Ky.  
Metropolitan By-Products Co., New York, N. Y.  
Midvale Steel Co., Norristown, Pa.  
Minneapolis General Electric Co., Minneapolis, Minn.  
National Lamp Works, Cleveland, Ohio.  
National Tube Co., Lorain, Ohio.  
North American Chemical Co., Bay City, Mich.  
Pennsylvania Salt Mfg. Co., Wyandotte, Mich.  
Pittsburgh & West Virginia Railways, Pittsburgh, Pa.  
Procter & Gamble Co., Cincinnati, Ohio.  
Raritan Copper Works, Perth Amboy, N. J.  
Republic Rubber Co., Akron, Ohio.  
Solvay Process Co., Detroit, Mich., and Syracuse, N. Y.  
Tennessee Coal & Iron Co., Birmingham, Ala.  
Union Electric Light & Power Co., St. Louis, Mo.  
United Gas & Electric Corp., New York, N. Y.  
Vincow Company, Marcus Hook, Pa., Norfolk, Va.  
West Penn Traction Co., Connellsville, Pa.  
Whitall Tatum Co., Millville, N. J.

# PRECISION THERMOMETER & INSTRUMENT CO.

1434 BRANDYWINE STREET, PHILADELPHIA, PA.

## PRODUCTS

Thermometers, for Laboratory, Factory and Power Plants; Hydrometers; Hygrometers; Barometers; Automatic Regulators; Meteorological Instruments; Vacuum Gauges; Precision Instrument Work—special and experimental; Calender-Micrometers; Ballistic Instruments.

## INSTRUMENT MAKING

We are manufacturers equipped for small machine work, precision instrument work—special and experimental. On receipt of specifications or drawing covering instruments of special design, information with reference to prices and deliveries will be promptly furnished. Our service to the Government during the War in the line of Precision Instrument making covered a wide range of endeavor, from gun parts and ballistic instruments to the finest powder dies.

## BALLISTIC INSTRUMENTS

"Precision" LeBoulengé Chronograph of improved design, as adopted in 1917 by U. S. Government and the largest powder manufacturers. Complete units furnished. Velocimeters, Drop Test Machines, etc.

## AUTOMATIC REGULATORS

Electrical for heavy duty. D.C. up to 110 volts. Direct connected valve.

## LOW TEMPERATURE THERMOMETERS

Special Chemical Thermometers reading to  $-100^{\circ}\text{C}$ . filled with toluol, and to  $-200^{\circ}\text{C}$ . filled with pentane. Made in Philadelphia. Tested at  $-190^{\circ}\text{C}$ .

## CALENDER MICROMETERS

Indicating and recording, for use on calendering machines to indicate the thickness of paper, linoleum, etc. (Each scale division is equivalent to 1/1000 inch.) Write for Bulletin "M."

## PRECISION THERMOMETERS

Armored	Glass Angle	Pipe Angle
Asphalt Testing	Glass Straight	Pocket
Bakers	Iron Angle	Precision
Bake Oven	Iron Straight	Railway
Brass Case	Japanning Oven	Recording
Brine Pipe	Kettle	Registering
Calorimeter	Laboratory	Ship Hold
Cellar	Marine	Six's Registering
Chemical	Mash Tub	Sterilizing
Cold Storage	Mash Pipe	Sugar
Cold Test	Maximum	Tin Case
Confectioners	Maximum and	Standard
Copper Case	Minimum	Titer Test
Distillers	Oil	Vulcanizing
Dough Testing	Oven	Weather Bureau
Electric Alarm	Pasteurizer	
Engineers	Pipe Straight	

In Sets for the Soap and Fat Laboratory.

In Sets, especially arranged in gradation of series for the dye industry Laboratories.

Laboratory Standards with Certificates by the Bureau of Standards. See Bulletin "C."

## ANEMOMETERS

Biran's Type, with improved zero setting device for Measuring Air Currents in Shafts, Ducts, etc.

## BAROMETERS

Mercurial Standard, U. S. Signal Corps type, as made by us for the United States Government. See Bulletin "C."

## HYGROMETERS

United States Weather Bureau type. Wet and dry bulb hygrometers for the accurate determination of relative humidity.

## VACUUM GAUGES

Full column mercurial gauges with trap.

## DRAFT GAUGES

Siphon type for Water or Mercury.

## CLINOMETERS

For Mariners and Aviators.

## SPECIAL APPARATUS

For Laboratory and Chemical Works.

## HYDROMETERS

Plain and combination standard grades only, with individually calibrated hand written scales.

The forms most in demand for Laboratory and Factory Use are in stock for prompt delivery.

Hydrometers in Standard Sets. See Bulletin "C."

## TACHOMETERS

Special Service in repairing, adjusting and Calibrating Centrifugal Tachometers.

## SERVICE

If you have a Temperature Problem in connection with your process we solicit your correspondence, and an opportunity to help you solve it. The peculiar and interesting experiences that we have had in this field of endeavor read almost like an Industrial Romance. "Where a condition of Heat is used to produce a Result" it is axiomatic that you can not control the result without first controlling the heat, and heat-control begins with temperature measurement. Armed with this AX(ion) we have invaded the premises of numerous "Processes" with results that have frequently been a revelation to the manufacturers, as well as a pleasure to us. We could tell interesting Histories about Distilling Turpentine, Mercerizing Yarn, Dyeing Hats, Vulcanizing Fiber and many other things where the Key to the Situation lay in the specially adapted Thermometer.

## LITERATURE

Circulars and a general catalog describing, listing and illustrating these instruments are published by us for free distribution upon request. The above, however, is but a partial list of our products since we construct many instruments to meet the particular requirements of our customers.

Long Stem Glass Thermometers with enclosed scales, for Chemical Plants. See Bulletins "C" and "E."



# PRESSED STEEL TANK COMPANY

Manufacturers of Seamless Bilged Barrels, Seamless Pressure Tanks,  
Hackney Drums

LOCAL SALES OFFICE  
1111 North La Salle Street, Chicago

GENERAL OFFICE AND WORKS  
MILWAUKEE, WIS.

NEW YORK OFFICE  
Woolworth Building

## PRODUCTS

Seamless Bilged Barrels.

Seamless Pressure Tanks.

Hackney Drums.

## SCOPE

We are the largest manufacturers of steel containers for the shipment of liquids and semi-liquids. Write our nearest office for catalog and prices.

**Hackney**  
MILWAUKEE  
Trade Mark

### HACKNEY 110 GALLON STEEL DRUMS

Made of 14 gauge steel and galvanized by hot dipping after they are made up. These drums are equipped with I Bar rolling hoops or U hoops, as desired. They comply with I. C. C. specifications No. 5.

### HACKNEY TWO PIECE DRUMS

Made of seamless drawn steel, 55 and 110 gallon capacity, in black or galvanized, complying with I. C. C. specifications No. 5A, for the shipment of acids and other dangerous articles.

### HACKNEY REMOVABLE HEAD STEEL BARRELS

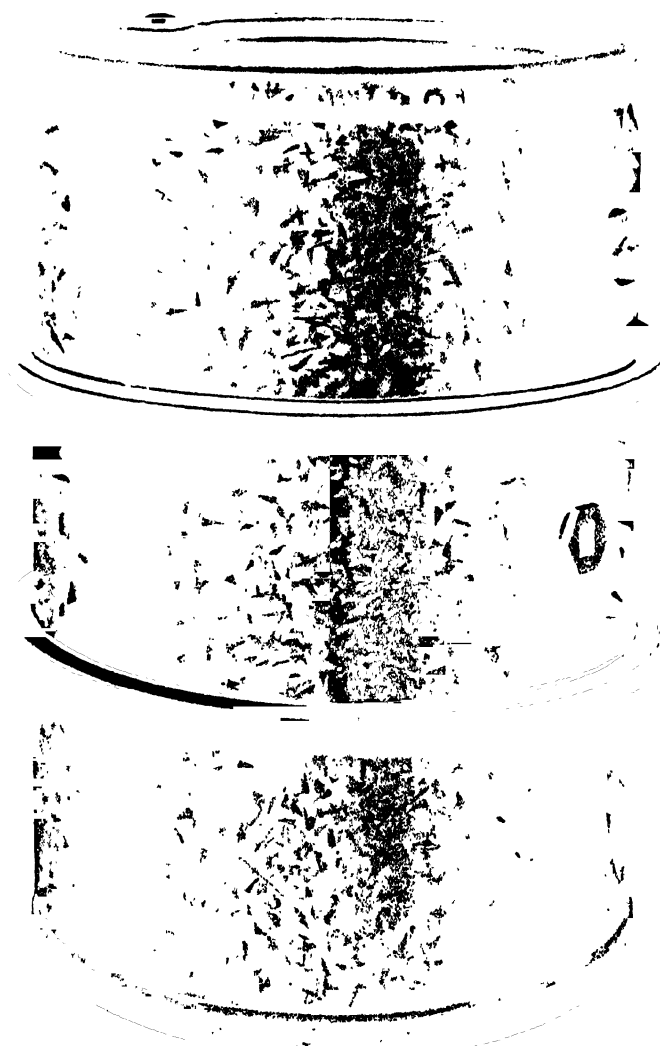
30 and 50 gallon capacity, made of seamless drawn steel, plain or galvanized, with a removable head that can be detached by unfastening one bolt. This is one of the best containers on the market for the shipment of semi-fluid products.

### HACKNEY SEAMLESS BILGED BARRELS

33 gallon and 55 gallon capacity, made of seamless drawn steel in black or galvanized, complying with I. C. C. specifications No. 5 and No. 5A, recommended for shipment of gasoline or other dangerous liquids.

### HACKNEY 55 GALLON STEEL DRUMS

Made of 16 gauge steel, hoops rolled in the shell, or equipped with U hoops or I Bar hoops, both openings in one head, or opening between hoops when desired.



HACKNEY DRUM

# W. E. PRINDLE COMPANY

Manufacturers of Dryers for the Chemical and Allied Industries  
COLUMBUS, OHIO.

## PRODUCTS

Direct, Indirect and Steam Heated Dryers.

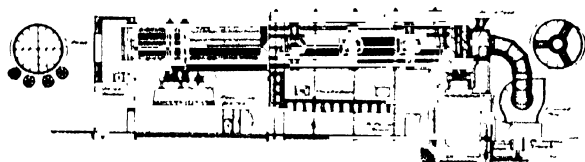
## DESIGN AND CONSTRUCTION

The Prindle Dryers embody many highly desirable features essential to the class of production for which our Dryers are suitable which are not found in the design of any competitive machines. These features are broadly covered by Letters Patent, are distinctly original and have an important bearing on the capacity and high efficiency of the Dryers. The application of the drying agent, whether it be Direct Heat, Indirect Heat, or Steam Heated Air, has been worked out so as to give the very best results.

Experience gained from Fifteen Years' Designing and Manufacturing over one hundred successful installations is the best guarantee that our customers will get equipment which will give them satisfactory results. Our long experience gained from designing, installing and instructing operators in the use of our dryers is at the service of new purchasers.

### TYPE 10 DRYER

Type 10 is a direct dryer, suitable for drying high grades of tannage, pressed blood, fish scrap, garbage, glucose feed, coal, etc.

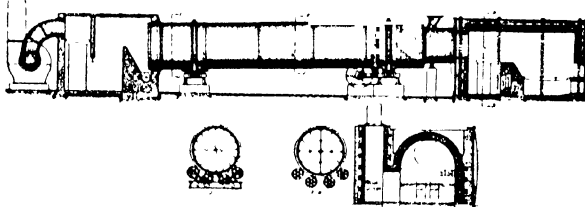


TYPE 10—DIRECT HEAT DRYER

Standard Sizes			
No. 50.....	Cylinder 50"x30' 0"	No. 70.....	Cylinder 70"x42' 0"
No. 55.....	Cylinder 55"x33' 0"	No. 80.....	Cylinder 80"x48' 0"
No. 60.....	Cylinder 60"x36' 0"	No. 90.....	Cylinder 90"x54' 0"
No. 65.....	Cylinder 65"x39' 0"		

### TYPE 12 DRYER, PARALLEL CURRENT

This Dryer is suitable for removing moisture from materials carrying a high percentage of water. The gases as they come from the Furnace are of such high



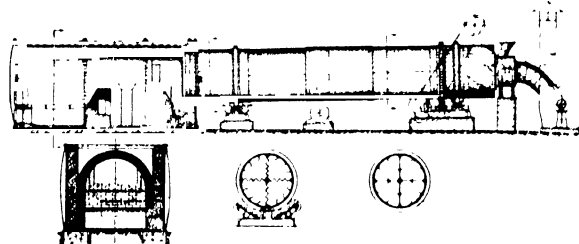
TYPE 12—PARALLEL CURRENT DRYER

temperature that, if permitted to enter the dryer, would instantly dry and burn up the finer particles of the material being dried, besides being very injurious to the Cylinder. To overcome these objections, the proper amount of fresh air is introduced through the bridge wall. This air mixes with the furnace gases, reducing the temperature to a point where they will not exceed 600 or 700° Fahrenheit when they enter the dryer.

Standard Sizes			
No. 50....	Cylinder 50"x30' 0"	No. 70....	Cylinder 70"x50' 0"
No. 55....	Cylinder 55"x33' 0"	No. 80....	Cylinder 80"x55' 0"
No. 60....	Cylinder 60"x40' 0"	No. 90....	Cylinder 90"x60' 0"
No. 65....	Cylinder 65"x45' 0"		

### TYPE 11 DIRECT HEAT DRYER, COUNTER CURRENT TYPE

This type has the furnace at the discharge end of the cylinder, and with the exhaust fan set at the intake end and close coupled. This machine allows for installation in a limited space. This dryer is used for drying high grades of salt, sand, minerals, or any class of material which is to be dried to a point where there remains but a fraction of 1% of moisture, and where the material will not be injured by coming into contact with fairly high temperature in its dry state. This Dryer is absolutely without a rival.

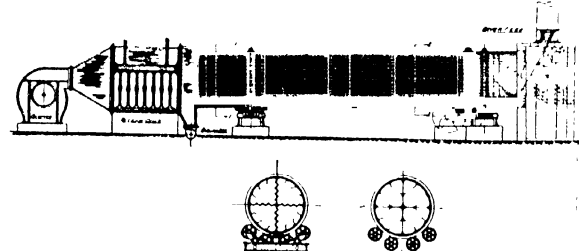


TYPE 11—COUNTER-CURRENT DRYER

Standard Sizes			
No. 50.....	Cylinder 50"x25' 0"	No. 70.....	Cylinder 70"x35' 0"
No. 55.....	Cylinder 55"x27' 0"	No. 80.....	Cylinder 80"x40' 0"
No. 60.....	Cylinder 60"x30' 0"	No. 90.....	Cylinder 90"x45' 0"
No. 65.....	Cylinder 65"x32' 0"		

### TYPE 13 DRYER, STEAM HEATED

This is the same type Cylinder as described as No. 11, excepting that instead of having a furnace we have a bank of steam coils placed at the discharge end of the Dryer through which the air from the blower fan passes before entering the Dryer. This is the Counter Current Type. This Dryer is suitable for removing the moisture from high grade chemicals, wood chips, butter and cheese, salt, sugar, stock feeds and in fact all sensitive materials requiring a low temperature, or materials which will not permit of passing the products of combustion through the Dryer.



TYPE 13—STEAM-HEATED DRYER

Standard Sizes			
No. 50.....	Cylinder 50"x25' 0"	No. 70.....	Cylinder 70"x35' 0"
No. 55.....	Cylinder 55"x27' 0"	No. 80.....	Cylinder 80"x40' 0"
No. 60.....	Cylinder 60"x30' 0"	No. 90.....	Cylinder 90"x45' 0"
No. 65.....	Cylinder 65"x32' 0"		

## GUARANTEE

Fire Dryers operating on Garbage, Stock Feeds, Fertilizers, Glucose Feeds, etc., which materials carry a moisture content seldom below 40%, are Guaranteed to show an evaporation of not less than 10 pounds of water per pound of combustible consumed in the furnace of the Dryer, based on a grade of slack Bituminous coal containing not less than 13,000 B. T. U. per pound as fired.

# PROCTOR & SCHWARTZ, INC.

**Proctor**  
DRYERS

Trade Mark

FORMERLY THE PHILADELPHIA TEXTILE MACHINERY CO.  
PHILADELPHIA, PA.

BRANCH OFFICES

Chicago, Ill. New York, N. Y. Charlotte, N. C. Providence, R. I. Hamilton, Ont., Canada

Cable Address  
PROCTOR Philadelphia

## PRODUCTS

"Proctor" Dryers—built in cabinet tray and truck tray types, in various sizes and capacities, for drying Chemicals, Pharmaceuticals, Paint Colors, Aniline Dyes, Colors for Printers' Inks, Lithopone, White Lead, Paris Green, Ceramics, etc.

## DESCRIPTION

The "Proctor" Dryer consists essentially of a metal enclosure, containing steam coils and fans suitably arranged about a space in which the wet material is placed on trays, either on racks or on trucks. The air within the enclosure, heated by means of the steam coils, is circulated across the trays in great volume by the large fans, drying the material in minimum time.

## "PROCTOR" SYSTEM OF RECIRCULATION

The various types of "Proctor" Dryers all operate on the principle of recirculating the heated air, a feature to which is due a great deal of the efficiency and economy of these machines. By this system the heated air is used over and over again, passing alternately across the material and through the steam coils. A moderate supply of fresh air is admitted and a corresponding amount of partially saturated air is expelled, constantly. This change of air takes place gradually and in relatively small volume, being so proportioned that the air within the enclosure is maintained at the point of highest drying efficiency. Tempered air only passes through the coils, resulting in a great saving of fuel over methods which take air at outside temperature directly to the coils.

## CONSTRUCTION

The "Proctor" Dryer is simply and substantially constructed of the most practical and durable materials throughout. Being built entirely of metal, it is fire-proof. All parts are accessible from the outside, the sides being closed in by removable panels clamped by wing nuts. These panels are made of two sheets of metal with air-cell asbestos between. They are tight-fitting and non-conductive, effectively preventing loss of air and heat. The steam coils are assembled and tested under 175 lbs. pressure before leaving our shops, to insure their being tight and perfect. The fans are of the disc type, made of iron and steel. They are of large diameter and move a tremendous volume of air but consume very little power because they operate at low speed.

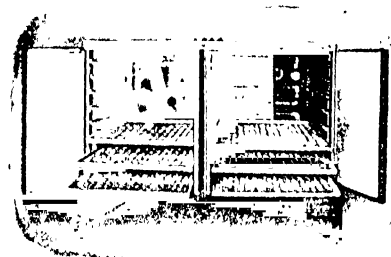
"Proctor" drying is correct in principle, insuring uniform, perfect results, safeguarding the material against case-hardening, baking, scorching, discoloring or other injurious effects of incorrect drying methods.

## FLEXIBILITY

"Proctor" Dryers may be increased in size and capacity at any time or they may be taken down and moved from one place to another. Thus they become convertible assets at all times.

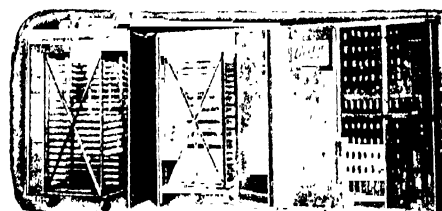
## SERVICE OF EXPERIMENT AND INFORMATION

We maintain an Experimental Laboratory in charge of expert drying engineers, who will investigate the drying of any material, submit a report of results and recommend an equipment for satisfactory and economical drying, without cost or obligation to the manufacturer. Illustrated catalogues and pamphlets are glad and freely given to anyone interested.



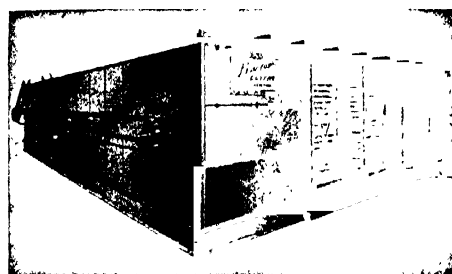
"PROCTOR" DRYER (CABINET TRAY TYPE) FOR ANILINE DYES, PAINT COLORS, CHEMICALS, PHARMACEUTICALS, ETC.

Built in various sizes to contain 12 to 60 trays. Smaller sizes widely used for laboratory purposes.



"PROCTOR" DRYER (TRUCK TRAY TYPE) FOR PAINT COLORS, ANILINE DYES, COLORS FOR PRINTERS' INK, CHEMICALS, ETC.

In this type of machine the trays of material are placed on trucks. Steam coils are located on both sides and fans between the coils and the truck space. The air is recirculated across the material and through the coils giving quick, uniform drying.



"PROCTOR" DRYER (TRUCK TRAY TYPE) FOR LITHOPONE, WHITE LEAD AND SIMILAR MATERIALS.

For drying large quantities of material, loaded on trays and carried by trucks through the dryer from feed end to delivery end. Operated in a progressive manner—as each truck of wet material enters the dryer, a truck of dry material comes out at the other end. An automatic device moves the line of trucks ahead. Side fans blow the heated air through the trucks first from one side and then the other, as they move forward.

# PROVOST ENGINEERING CORPORATION

50 F Church St., Hudson Terminal  
NEW YORK, N. Y.

Telephones  
CORTLANDT 54 55 56

WORKS  
Provost and Eagle Streets  
Brooklyn, N. Y.

## PRODUCTS

Mixers, Filter Presses, Vacuum Pumps, Acid Pumps, Liquid Pumps, Pressure Blowers, Pulverizing Machinery.

## INQUIRIES

When making inquiries it will greatly facilitate matters if our correspondents will give us the information asked for below.

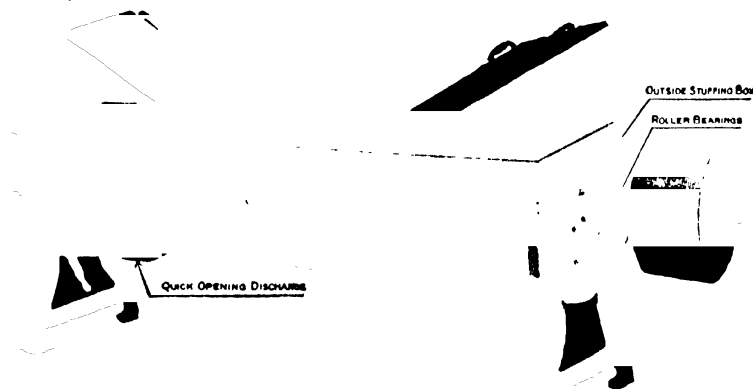
1. Materials to be mixed.
2. Weight per cubic foot.
3. Capacity desired per hour.

## "PROVO" MIXER, USES

Wherever thorough and efficient mixing of materials is desired. Particularly adapted for various chemicals, colors, pharmaceutical preparations, fertilizers, etc.

Among users of mixers there has been a growing demand for a machine which would overcome the annoyances experienced in operating the old style mixers. They were hard to clean because the agitator was not removable, the stuffing boxes were difficult to adjust and permitted oil to contaminate the charge of material in the mixer. A great deal of trouble was also experienced on account of the legs or stands breaking.

Based on our many years of experience our Engineers have eliminated all the above troubles and have perfected a mixer known as the Improved "Provo" Mixer.



## "PROVO" MIXER

Our standard "Provo" Mixers are built of steel.  
We also galvanize the steel and equip with gear drive if desired.

TABLE OF SIZES, ETC., OF PROVO MIXER

Size	CAPACITY			MEASUREMENTS			PULLEYS		Horse Power Depending on Material	Shipping Weight
	*Pounds	Gallons	Cu. Ft.	Length	Breadth	Height	Size	Speed R.P.M.		
No. 1	80	21	2.80	4' 0"	1' 8"	3' 4"	12" x 3	40-50	$\frac{1}{2}$ -1	230
2	115	30	4.00	4' 10"	1' 8"	3' 4"	15" x 4	40-50	$\frac{1}{2}$ -1	375
3	140	45	6.00	6' 10"	1' 8"	3' 1"	15" x 4	40-50	1 - $1\frac{1}{2}$	460
4	210	55	7.33	6' 0"	2' 0"	3' 5"	18" x 5	35-45	$1\frac{1}{2}$ -2	660
5	300	80	10.66	7' 0"	2' 0"	3' 5"	20" x 5	35-45	2 - $2\frac{1}{2}$	775
6	380	100	13.33	7' 3"	2' 4"	3' 6"	20" x 6	30-40	$2\frac{1}{2}$ -3	940
7	460	120	16.00	8' 9"	2' 4"	3' 6"	20" x 6	30-40	$2\frac{1}{2}$ -3	1200

\* Pound capacity based on flour. Further information for larger sizes on request.

## "PROVO" MIXER, FEATURES

1. **Easily Cleaned**—because the "Provo" Agitator can be removed in a few minutes without disturbing the rest of the machine. On other mixers the agitator is not removable.

2. **Adjustable Stuffing Boxes**—located on outside of heads and not connected with bearings in any way.

3. **Roller Bearings**—located outside of heads and not connected with stuffing boxes, consequently no oil can contaminate the product to be mixed. These bearings also reduce power required.

4. **Extra Heavy Stands or Legs**—These are practically unbreakable.

**Most Efficient.**

## KNEADING MACHINES

We have also placed upon the market a new type of mixer entirely different from any that has yet been produced. This machine is especially adapted for mixing dough or any similar material. Our mixer consists of a large cup-shaped container mounted on a platform which is revolved continuously by a gear and pinion underneath the platform. A long shaft with a wing-shaped propeller projects downward into the container. The whole shaft moves in a peculiar manner in order to stir up every particle of the material in the container. This motion in connection with the revolving of the container assures an absolute thorough mixture. The container is so arranged that it can be automatically tilted for emptying.

This mixer is manufactured in the following standard capacities:

	1	2	3	4	5	6	7
Flour lbs.	55	110	165	220	275	330	440
Dough lbs.	90	165	255	330	420	510	660

Due to this mixer being something entirely new, it was impossible to secure photographs or cuts of this machine before the catalog went to press. However, prices and further data will be furnished on request.

# PULMOSAN SAFETY EQUIPMENT CO.

Manufacturers of

"Pulmosan" Safety Devices

45 WILLOUGHBY STREET, BROOKLYN, N. Y.

Telephone  
TRIANGLE 4435

## PRODUCTS

A large variety of Safety Devices, in stock, covering all hazards peculiar to the chemical industry.

Respirators for Dust and Fumes

Pure Air Masks and Breathing Devices

Sand Blast Helmets, with or without air supply

Helmets; Pure Air and Welding

Hoods; Acid and Dust

Masks; Acid, Ammonia, Babbitting, Chipping, Face, Furnace and Respirator

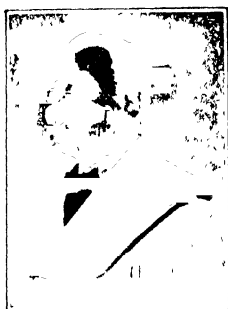
Safety Garments, Leggings, Gloves and Goggles

Airtight Goggles

Special Helmets, hoods and respirators made to your individual requirements.

## "PULMOSAN" RESPIRATORS

We manufacture many different kinds both for dust only or for dust and light fumes. Each particular kind of a Hazard requires a respirator that is best suited for the purpose. State the conditions in your shop and we will supply your needs promptly from stock. We are specialists in the art of making respirators. Consult us



"PULMOSAN" RESPIRATOR  
NO. 11. "PATENTED"

**No. 11 Respirator**—Lightest and smallest respirator on the market. It is cool and comfortable. The filter element consists of a combination of fine screening materials, so perfectly supplementing each other as to keep out all dust. Adjustable to fit any head and face. For dust only.



"PULMOSAN" ALUMINUM  
RESPIRATOR NO. 18

**No. 18 Respirator**—This type Respirator with the positive exhaust valve, the inflated cushion and the adjustable straps is master of all respirators. Least number of parts, made of spun aluminum, light, comfortable and very efficient. Will positively fit any face and very sanitary.

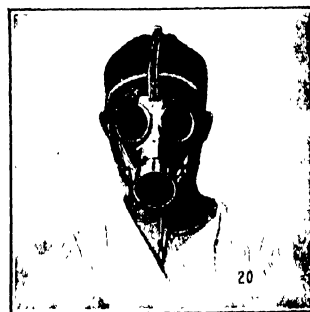
## SAFETY MASKS AND HELMETS

We manufacture a complete line of these safety appliances for every known industrial operation. We have protectors for use in atmospheres laden with any kind of fumes, and dust. Each type of protector

is made for certain purposes. When writing to us state the conditions surrounding your workmen.

## "Pulmosan" Face Mask No. 20

—Whenever dust or fumes are of such an irritating nature as to injure the eyes as well as the respiratory tract, we strongly recommend the use of this mask. It eliminates the discomfort caused by wearing respirators and goggles. Glasses will not fog due to chamber arrangement. Completely cover the head.



"PULMOSAN" FACE MASK NO. 20  
Hood can be supplied to completely cover the head.

## "Pulmosan" Dust Hood No. 31

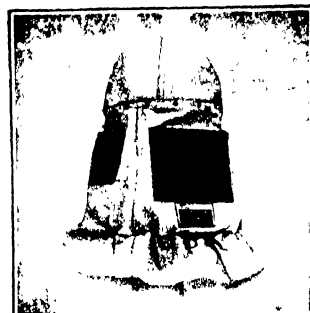
—This hood being made of cotton cloth is very light and has a series of wire cloth passages which allow the air to circulate thruout the helmet and yet keep out the fine particles of dust. One hundred square inches of breathing passages. Light, comfortable and adjustable. Celluloid, Mica or Glass Windows can be furnished.



"PULMOSAN" DUST HOOD  
NO. 31. "PATENTED"

## "Pulmosan" Sand Blast Helmet No. 30

—The lightest and most serviceable sand blast helmet known. Made from 10 oz. cotton duck with multiple screens to protect the wearer from the constant blow of sand, yet made so that a continuous flow of air is circulated thruout the helmet at all times. Will fit any head, and outlast any three helmets of any other make.



"PULMOSAN" SAND BLAST HELMET NO. 30. "PATENTED"

## DELIVERIES

Safety Devices are always needed in a hurry for immediate use; our stock is such that shipment is generally made the day order is received.

Get acquainted with "Pulmosan" Service.

ILLUSTRATED CATALOG ON REQUEST



# PYROELECTRIC INSTRUMENT CO.

Manufacturers of Electrical Precision Instruments  
TRENTON, N. J.



ITALY  
Henry Cio & Clerici  
Via Montebello 36 Milan

ENGLAND  
Graham Chemical Co.  
87 Victoria St. Liverpool

JAPAN  
Shimadzu Seisakusho, Ltd.  
Nijo-Kawarimachi Kyoto

## PRODUCTS

Ammeters (portable)	Potential Sets
Electro-Dynamometers	Potentiometers
Electrometers	Pyrometers (indicating)
Galvanometers	Resistance Boxes
Hypsometers	Resistance Standards
Hydrogen-Ion Apparatus and Chemicals	Resistance Thermometers
Inductance, Fixed and Variable Standards	Standard Shunts
Keys and Switches	Thermocouples
Lamp and Scale Outfits	Thermocouple Calibration Outfits
Milliammeters	Volt Boxes
Millivoltmeters	Voltmeters (portable)
	Wheatstone Bridges

## SERVICES

Pyrometer engineering and installations, consultation services and advice regarding uses of electrical precision instruments, careful supervision and construction of special instruments and experimental work on a cost basis, commercialization and marketing on a royalty basis of new and valuable scientific apparatus which is fully developed.

## NORTHROP PYROVOLTER, A GUARANTEED PYROMETER

This pyrometer works on the potentiometer system and is independent of all resistance changes. Indications are given by deflections, directly on a scale. Platinum or base metal couples, or both, may be used with the same instrument. It is guaranteed accurate within 1/5 of one per cent. of full scale. The Pyrovolter is entirely self-contained and exceedingly rugged. It is adapted for all temperature measurement work with thermocouples, especially where known precision is essential; it is equally valuable for portable testing work, laboratory standardization, and general low voltage measurements. Furnished in from one to four ranges, marked either directly in degrees or in millivolts, or both. Built in portable and wall-type instruments. Catalog CE-17.

## THERMOCOUPLES

We supply platinum and base metal thermocouples in all types of protection tubes. Couples of 12, 18 and 30 inches length are regularly carried in stock. Unusually sturdy construction is used throughout, assuring long life. Catalog CE-17.



**THERMOCOUPLE CALIBRATION OUTFIT**

For accurately checking couples against both the melting points of metals and standard couples. Various outfits are offered, both with and without furnaces.

## HYDROGEN-ION APPARATUS



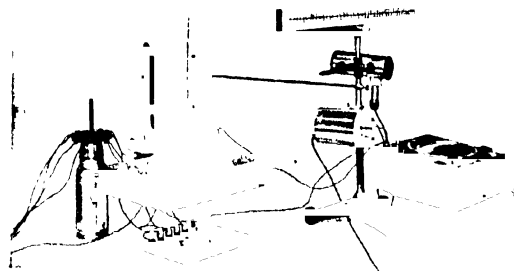
**H-ION PYROVOLTER**  
For use with low resistance electrodes

The Acree Apparatus for Hydrogen-Ion Determination offers both simplification and highest precision. In electrochemical determinations, a double hydrogen electrode—the ultimate standard—is used. The difference of potential between the unknown solution against one hydrogen electrode and a standard buffer solution against another hydrogen electrode is measured. Calculation is of the easiest. Electrometric titrations may also be carried out. Two precise deflection potentiometers

(Pyrovolter type) are supplied, one for use with electrodes of any resistance (including the Acree) and another for use with low resistance electrodes (Elliott, Clark, etc.). For colorimetric determinations, standard buffer tablets and standard indicator tablets are put up. A complete line of accessory indicators and chemicals is carried in stock. Catalog CE-18.

## ELECTROMETERS

We have a complete line of instruments for electrostatic measurements, including the Compton Quadrant Electrometer and two types of string Electrometers. The Compton Quadrant Electrometer has a total range of 0-50,000 mm. per volt, and a capacity of only about 12 cm. Catalogs CE-16 and BE-19.



**NORTHROP MICROVOLTER OUTFIT**

For measuring slight temperature differences to an accuracy of 1/200°C. Our D. C. Swing Coil Galvanometer and Lamp and Scale Reflection Indicator are included in the set up.

## LABORATORY MEASURING INSTRUMENTS

For general laboratory measuring work we offer both D. C. and A. C. Swing Coil Galvanometers with an improved lamp and scale for attachment direct to city lighting circuit, a complete line of precision dial decade resistance boxes and resistance standards, single value "Handy" Resistance Units of resistances from .1 ohm to 10,000 ohms, Wheatstone Bridges, and a variety of similar instruments of the highest quality.

## PUBLICATIONS

We are always glad to forward a complete set of our literature on request, and also to place your name on our mailing list for the Pyroelectric Bi-Monthly Bulletin, a unique instrument publication. Bulletin BE-19 is a Condensed Catalog, briefly describing and listing each of our products.



# QUIGLEY FURNACE SPECIALTIES COMPANY, Inc.

Local Address  
Quigley Co.

GENERAL OFFICES  
26 Cortlandt Street  
NEW YORK, N. Y.

Code Used:  
WESTERN UNION, A LETTER

FACTORIES: JAMAICA, N. Y., FREDERICKSBURG, VA.

SALES OFFICES  
BALTIMORE BUFFALO CHICAGO DENVER PHILADELPHIA PITTSBURGH PROVIDENCE

Representatives in 35 cities in the United States and Canada

## PRODUCTS AND SERVICES

**Hytempite** - A Refractory Cement for bonding silica fire clay brick, and for kindred uses

**Carbosand** - A highly Refractory Granular Material for making rammed-in linings, special tile, patches, and joints in furnace structures

**Insulbrix** - A specially prepared Cellular Insulating Refractory Brick which keeps heat in or out

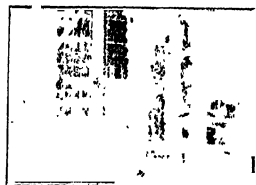
**Powdered Coal Equipment** - Quigley System for preparing, distributing and burning powdered coal and other fuels

### HYTEMPITE

A high temperature furnace cement which forms a lasting union between materials to be joined. It sets at normal temperatures and retains its strength up to temperatures at which the best quality of brick loses its strength and becomes soft



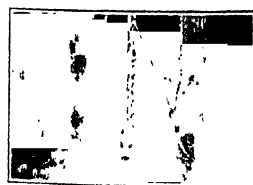
HYTEMPITE FOR CUPOLAS AND LADLES



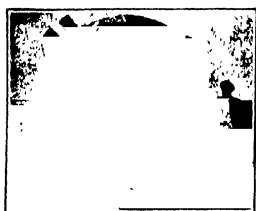
HYTEMPITE FOR BOILER SETTINGS

Hytempite, when used in place of fire clay for laying up brickwork, greatly adds to the life of the structure

It is successfully used for furnace and boiler settings and repairs; for setting tile, retorts, oil stills; lining metal melting furnaces, pit furnaces, open flame melting furnaces, foundry cupolas and ladles, and as a core wash.

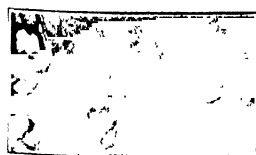


SEALING JAMB JOINTS OF COKE OVENS



HYTEMPITE FOR LAYING UP LININGS OF LARGE LADLES

Tests have proven that Hytempite used as a binder, when air-set, forms a joint as strong as the refractory material united, and that the strength is not impaired but increased by the action of heat. This property makes a wall or structure impossible to obtain with fire clay, or other materials which depend on heat to effect a bond or vitrification



HYTEMPITE FOR PIT FURNACES



HYTEMPITE FOR COATING CORES

Hytempite withstands the cutting action of flames and is especially recommended for oil furnaces where the gases are usually of high velocity

Hytempite can be used as a coating or wash, or to smoothen and harden the surface of a furnace lining to protect it from abrasion, etc



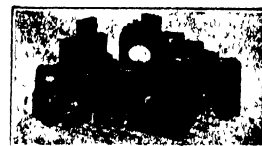
MIXING REFRACTORY MATERIALS WITH HYTEMPITE FOR RAMMED IN LININGS

Hytempite can be used wherever fire brick or tile are used

### CARBOSAND

A highly refractory fire sand made in the electric furnace by fusing at high temperature a mixture of natural silica in its purest form and petroleum coke. Owing to its highly refractory nature it is an ideal material for use where the scouring action of flame or hot gases attack a lining

It is used for making rammed in linings, special shapes, tile and repairs, and for surfacing walls of furnaces or other structures subject to severe flame action



SPECIAL SHAPES AND TILE

### INSULBRIX

A specially prepared cellular insulating refractory brick for furnaces or other structures. These brick are made in standard fire brick size and special shapes. Their weight is about one-half that of ordinary fire brick. They have low thermal conductivity. 1 in. of Insulbrix being equal to six to ten times the same thickness of fire, or red brick, depending upon conditions such as furnace temperature, conductivity of other brick, etc. They have high heat resisting quality, their fusing point being over 2900° Fahr. without showing shrinkage at 1800° Fahr. They have a crushing strength of 425 lbs. to the sq. in. They are used as an insulating course in boiler settings, furnaces, kilns, ovens, or other structures where the conservation of heat is an important item

### QUIGLEY POWDERED COAL SYSTEM

For preparing, transporting and burning powdered coal. Pulverized coal is transported in bulk through small diameter standard wrought pipe to bins at furnaces.

Entire equipment is dust tight from crusher to furnaces.

With this improved method of burning powdered coal, the fuel is automatically weighed as sent to the furnace bins. By turning a hand or chain wheel absolute control of fuel fed to the burners is obtained

Send for bulletins describing complete system, with illustrations of plants now in successful operation.

# RAYMOND BROS. IMPACT PULVERIZER CO.

OFFICE AND WORKS

1309 N. BRANCH STREET, CHICAGO, U. S. A.

## PRODUCTS

**Roller Mills, Automatic Pulverizers, and Vacuum Air-separators for the fine grinding of all dry materials to a powder.**

### NO. 0000 PULVERIZER

This little mill comes most nearly filling all the grinding requirements of Chemical, Color, Dyestuffs and Paint Manufacturers and that is why we place it first in these pages.

We have been specializing in the grinding of all materials to a powder for the past 40 years and it has only been recently that there has been a large demand for a small, complete, dustless pulverizing unit which would do all things that our larger mills are doing successfully in hundreds of plants.

It was on this account that we designed the No. 0000 Pulverizer and it has amply proved its adaptability to small grinding requirements by the fact that in five years' time we have put more than four hundred of them in successful operation.

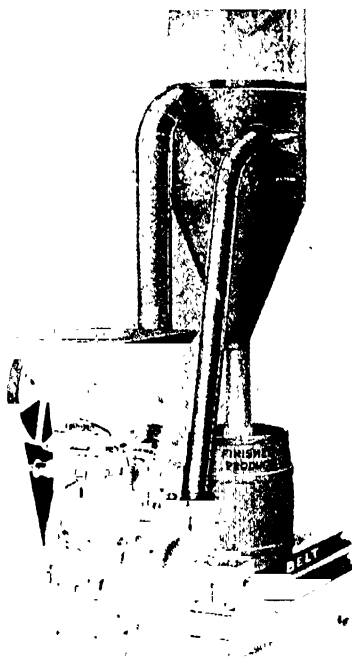
A good many firms use as many as five of them to handle their different materials and to produce an extremely fine uniform grind when they are unable to buy satisfactory ground products.

The No. 0000 Pulverizer has so many points of interest that they cannot all be mentioned in this small space, but a few of them are of special interest:

It is especially useful in handling small quantities of such materials as dry colors, clays, various paint materials, chemical compounds, dyestuffs, and similar products.

It is very compact, occupies 4 by 4½ ft. of floor space, requires 5 H. P. and gives 200 to 1000 lbs. per hour capacity, depending upon material. It gives any fineness from 50 mesh to 200 mesh and finer.

A special circular giving full description will be sent on request.



NO. 0000 RAYMOND PULVERIZER

## ROLLER MILLS

These are built for capacities of from 1 to 10 tons per hour and for fine or coarse grinding.

They are of the suspended roller type, crushing and pulverizing the material by centrifugal force. The fine material is carried away from the grinding chamber by our air separation principle as fast as it is made, eliminating the clogging effect produced by screen separation. In this way the rolls are always working on coarse material.

Raymond roller mills have been adopted as standard equipment by many large industrial corporations for grinding materials such as coal, coke, gypsum, limestone, phosphate rock, etc., to 100-mesh; and talc, graphite, barytes, caustic lime, lithopone, etc., to 200-mesh and finer.



RAYMOND ROLLER MILL

## AUTOMATIC PULVERIZERS

These, like the roller mills, are equipped with air separation for the production of uniform fine products, but they are of the high speed type and therefore used for softer materials like clay, dry colors, hydrated lime, litharge, etc.

They are built in several sizes and will grind to any fineness by a simple adjustment in the air separator.

They can also be equipped with our special automatic throw-out attachment for separating impurities from such materials as hydrated lime, litharge, etc.

Because of this special attachment they have been adopted by the United States Government for separating the values from radium ore.



RAYMOND AUTOMATIC PULVERIZER

*Continued on Next Page*

### SPECIAL FEATURES AND ADVANTAGES

The installation shown is typical of the Raymond system as in all cases the piping can be arranged to place the collector at almost any point where the material is to be discharged.

This discharge can be made into any convenient storage bin or conveyor and requires no extra power for operation.

In some of these installations the collector is set as high as 100 ft. and at a distance from the mill, eliminating at least one elevator and sometimes a conveyor.

**No Screens or Bolters.**—The mills shown on these pages require no screens or bolters to produce the required fineness, as this is obtained automatically by the use of our air separators.

These separators after once being adjusted require no attention and produce absolutely uniform fine products containing no lumps or over sizes. They will give any fineness desired by a simple adjustment.

**Dustless Operation.**—The Raymond system is entirely enclosed and dustless in operation, as it is one complete unit which receives material from storage, pulverizes it, and delivers a uniform fine product to the required point.

### MATERIALS USED FOR WEARING PARTS

All parts of the roller mills and pulverizers are built of the best and most economical materials for their particular purposes.

In the roller mills, the die ring against which the rolls crush the material is made of a special steel. The rolls are made of chilled iron which is  $1\frac{1}{2}$  ins. thick. The other wearing parts in the mill, such as plows and plow tips (which throw the material up between the roll and ring), liners for the ports in the base of the mill, etc., are made of manganese steel.

In the pulverizers, the beaters for breaking up the material are made of manganese steel, and the beater chamber is lined with cast iron liners which can be readily replaced, eliminating any chance for the pulverizer itself to wear out.

The fans for both the roller mills and the pulverizers are of our own special make, using heavy cast iron shells over one inch thick. These shells can also be lined with replaceable iron liners to withstand abrasive materials in case the customer requires it. The fan wheel is composed of a cast steel spider, to which are attached either removable manganese, blue annealed, or tank steel blades. Which kind of blades is used depends upon the material ground.

We have found by experience that all of these ma-

terials used for wearing parts are the most economical for that particular purpose. There are harder forms of steel which would last longer for some of these purposes, but the costs are so great that it is economy to use the materials we have mentioned and change oftener.

The air separator, cyclone collector and piping are made of extra heavy gauges of galvanized steel.

All parts are machined, fitted and assembled in our own plant, and repairs are always kept on hand for immediate shipment in case of a breakdown.

### HOW TO SPECIFY

To enable us to quote prices and guarantees on the right machinery, it is necessary to have all the information that can be supplied in regard to the proposition.

Always include the material to be ground and the capacity and fineness required. In this connection we would like to have some small mail samples, showing the crude material intended for the mill and the finished product to be duplicated.

If there is no sample of the finished product, kindly advise, in the terms of the Tyler standard screen scale, the fineness required.

### COOPERATIVE SERVICE

The Engineering Department, backed by 40 years' experience in the pulverizing field, is available for advice in regard to the solution of grinding problems.

In many cases, by using special equipment in connection with the standard mills, it has been able to solve a customer's grinding problem and greatly decrease cost of production.

The department will also design an installation best suited to the requirements if sketches of the present or proposed plant are enclosed, showing approximately where the pulverizing machinery is to be placed.

### GUARANTEE

Every Raymond mill is guaranteed, not only as to workmanship, but also as to performance. After receipt of full information in regard to pulverizing problem, we will send contract covering this guarantee.

### PARTIAL LIST OF MATERIALS HANDLED BY THE RAYMOND SYSTEM

Aluminum silicate	Filter press products	Paints (other)
Arsenic of lead	Foundry facing	Paints (slate)
Asbestos and asbestos rock	Fuller's earth	Paints (umber)
Asphalt and asphalt rock	Glass	Paris green
Barytes	Graphite	Pennut vino
Bauxite	Gypsum rock and plaster	Phosphate rock
Blackening materials	Infusorial earth	Pitch
Blood (dried)	Insecticide powder	Plaster of Paris
Blue stone	Iron ores	Pumice stone
Bone black	Iron oxides	Red lead
Borax ore and borax	Iron, Sulphate of	Retarder
Calcite	Kaolin	Rosin
Calcium phosphate	Kelp	Rottonstone
Carbon	Kieselguhr	Rubber, hard
Carbonates	Lampblack	Salt
Carnotite ore	Lead ores	Shale
Casein (dried milk)	Lime, Borate of	Shells (all kinds)
Cast iron borings	Lime, Caustic	Silica
Chalk	Lime, Hydrated	Slags (all kinds)
Charcoal	Limestone	Slate
China clay	Lithopone	Soap
Chrome colors	Magnesite	Soapstone
Chromite	Magnetite	Soda, Bicarbonate of
Clay	Manganese ore	Sodium nitrate
Coal	Manganese oxide	Starch
Cobalt	Marble and marble dust	Sugar
Cobalt oxide	Marl	Sulphur
Coke	Medicinal powders	Talc
Copper oxide	Mica	Tin oxide
Diatomaceous earth	Milk sugar	Tobacco
Elevator screenings	Ocher	Trap rock for asphalt paving
Enamel (white)	Paints (dry colors)	Tripol
Felspar	Oxalic acid	Waterproofing
Flint	Paints (iron ores)	White lead
Pulverizers	Paints (litharge)	Zinc skimmings

And a number of composite materials impossible to classify.

# RAYMOND ENGINEERING CORPORATION

WORKS  
Farmingdale, L. I.

General Offices, Puck Building  
309 LAFAYETTE STREET, NEW YORK, N. Y.

## PRODUCTS

Ammeters  
Cell-O-Meters  
Circuit Breakers  
Contact Making Devices  
Electrical Heating De-  
vices  
Gas Engines  
Lamp Fixtures

Lighting Devices  
Pumps  
Regulators  
Rheostats  
Solenoids  
Spring Motors  
Thermostatic Controls  
Special Machinery

## SERVICE

Our engineering department is at the service of the chemical industry in solving such problems as we are particularly acquainted with.

We are well adapted to develop small mechanical devices needed to meet special requirements.

## CELLOMETERS



CELLOMETERS

The Cellometer is the only battery-indicating instrument invented which combines the feature of an ammeter and an electrical battery tester. By simply pressing the button, the ammeter is eliminated from the circuit.

The Cellometer checks the electrical condition of the battery by superimposing about a quarter load through an especially designed resistance unit, and a reading is then obtained, which is indicated by having three distinct spaces on the dial. The green indicates a full battery; the yellow a half discharged battery; and the red a fully discharged battery, but is so "calibrated" that when reading "red" it is not yet too late to have the battery overhauled.

The old method of using a hydrometer is unnecessary when the Cellometer is employed, as a false reading can easily be obtained on a hydrometer by simply placing electrolyte of different specific gravity in the battery.

The Cellometer can be used for both a battery-testing instrument, and as an ammeter. It is designed for use on all types of storage batteries, whether used in automobiles, farm-lighting plants, fire-alarm systems; or in fact anywhere that the storage battery is employed, the Cellometer is invaluable.

The Cellometers are manufactured in different styles and finishes. The model shown herewith is a type for automobiles which replaces the present ammeter now in use, by simply using the same wires that run to the ammeter.

## ROTARY PUMPS



FIG. A

FIG. B



FIG. D

FIG. C

EXETER ROTARY PUMP

The types of rotary pumps thus far evolved may be divided broadly under these classifications: first, those using the rotary gear movement; second, the rotary plunger types, and third, the rotary bucket or packing-strip types. Practically all of these designs require continuous replacement due to the great friction taking place either the moving parts themselves or between the moving parts and the casing.

The **Feuerheerd** Rotary Pump is based upon an entirely new idea of rotary pump construction, combining in one compact unit the principal advantages to be found in the centrifugal and reciprocating types of pumps without the shortcomings of either. The pump is self-priming; its action is positive and the flow of the water is continuous. There are no valves and no reciprocating parts to get out of order and, compared with its output, the size of the pump is remarkably small.

Because of its rolling rather than rubbing surfaces, all wear has been reduced to a minimum. Dirt and grit do not seem to affect the pump, inasmuch as there is practically no wearing or sliding contact.

The **Feuerheerd** Rotary Pump can be arranged direct-connected, geared, or belt-driven to operate with any form of drive, i. e., electric motor, turbine, and steam, gas, or oil engine. These pumps are especially suitable for general water and fire service, for boiler feed, circulating and lubricating work, for creating vacuums for evaporation in pans, condensers, refrigerators, etc., and for handling oils, syrups, milk, molasses, mine water, tar, asphalt, acids, chemicals, paints, turpentine, gasoline, soaps, etc.

The action of the pump can readily be understood by examination of the four illustrations at the top of the page.

We manufacture the smaller sized Pumps under this patent for the Exeter Machine Works, Inc., whose general offices are located in New York, N. Y. The exclusive sales and manufacturing rights for the automotive industry in this country, however, are held under a sub-license from the Exeter Machine Works, Inc., by the Raymond Engineering Corporation.

# READ MACHINERY CO.

Manufacturers of  
Mixing Machinery  
YORK, PA.

## PRODUCTS

Mixing Machinery, Sifting and Blending Machinery,  
Automatic Weighing Hoppers.

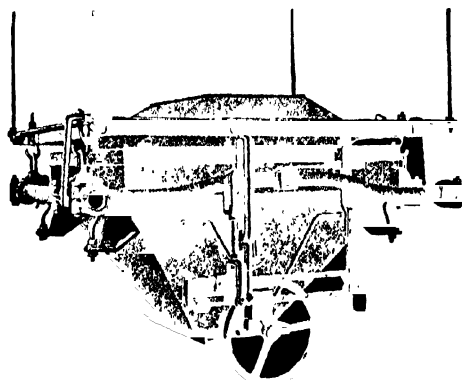
## FACILITIES

The Read Machinery Company has for years been building a complete line of modern mixing machinery until recently chiefly used in the baking industry.

Many mixing, grading, blending and sifting problems encountered in the making of products from flour are similar to those met with in the manufacturing fields producing pharmaceuticals, cosmetics, food products, dry colors, dyes, etc. Those in the above manufacturing lines should investigate our equipment before adding to their production facilities.

### READ AUTOMATIC WEIGHING HOPPER, FOUR POINT SUSPENSION TYPE

Accuracy, in combination with rapid handling, is assured in using this Hopper. Weighing is automatically controlled, and material delivered direct to mixer. Labor is greatly reduced and production increased.



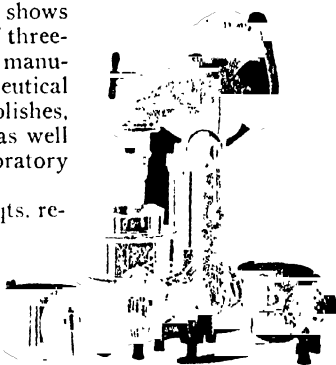
AUTOMATIC WEIGHING HOPPER

### READ THREE-SPEED MIXER

This illustration shows Type D of our line of three-speed mixers for manufacturing pharmaceutical products, pastes, polishes, food products, etc., as well as for many laboratory purposes.

Capacity up to 80 qts. requires 1 H.P. motor giving a maximum of 400 R.P.M. for the beater.

Write for our complete catalog of these machines.

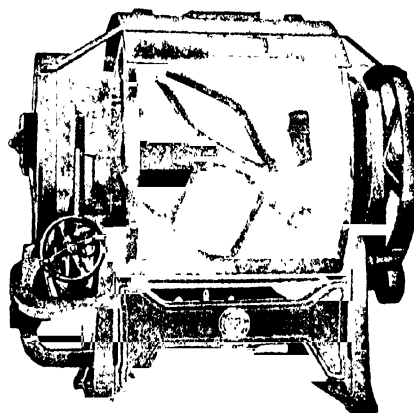


HEAVY DUTY 3-SPEED MIXER

### READ REVERSIBLE DOUBLE ARM MIXER

This mixer has a capacity up to 1800 lbs. (water), is motor or belt driven, and is geared between 20 and 40 R.P.M. with our standard mixing arms. Higher speed arms can be supplied. 20-30 H.P. is required.

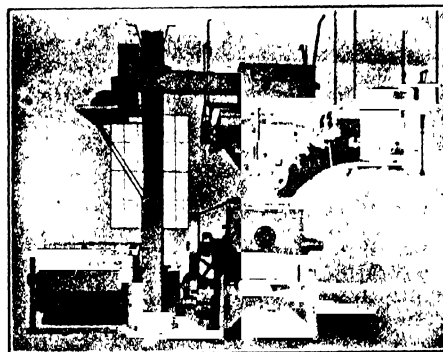
This machine is one of a number of types and sizes of our mixers. There is one of these machines for every mixing problem.



READ REVERSIBLE DOUBLE ARM MIXER

### COMPLETE SIFTING, WEIGHING AND MIXING UNIT

The accompanying illustration shows a complete unit manufactured by us that will meet such demands as sifting talc, weighing it, and treating it with essential oils and mixing the materials in the making of talc powders. Many other products can be made requiring similar methods of treatment with economy in operating, labor and production costs.



COMPLETE SIFTING, WEIGHING AND MIXING UNIT

# READING IRON COMPANY

## Guaranteed Genuine Wrought Iron Pipe, Etc.

Cable Address  
"READIRON"

New York  
Boston

Philadelphia  
Pittsburgh

READING, PA.

Chicago  
Cincinnati

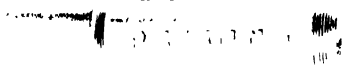
Codes Used:  
Lieber, A, B, C, 5th and 6th Ed.  
Western Union, and Private  
Fort Worth  
Los Angeles

### PRODUCTS

Guaranteed Genuine Wrought Iron Pipe, Casing, Line, and Drive Pipe for the Oil and Gas Industry and for Brine Wells, etc. Wrought Iron Pipe Bends and Coils. Charcoal Iron Boiler Tubes. Sugar Mills, Cotton Compresses, and other Special Heavy Machinery. Special Heavy Castings of all kinds. General Forgings up to 50 Tons.

### THE READING IRON COMPANY

Reading Iron Company, the world's oldest and largest producer of Genuine Wrought Iron Pipe, manufactures 552 different sizes and kinds of tubular products, ranging from  $\frac{1}{8}$  to 20 inches in diameter, suitable for every industrial piping requirement.



SECTION OF PIPE SHOWING MARKING

Every length of Reading Wrought Iron Pipe has the word READING rolled in the iron, as shown in the above illustration, except Redrawn Pipe, which has the letters depressed.

### WROUGHT IRON PIPE IN THE CHEMICAL INDUSTRIES

For reasons to be explained later in these pages, Genuine Wrought Iron Pipe is vastly superior to steel pipe for industrial chemical requirements.

Its far greater ability to withstand corrosion recommends its use wherever the nature of the material being handled does not preclude the use of iron in any form.

In addition to its use for water, steam, air, and vacuum lines, it is extensively used for the following purposes, among others:

- Crude oil and petroleum derivatives and gases
- Illuminating and fuel gas and various by-products of gas manufacture
- Solvents such as acetone, methyl alcohol (wood alcohol), industrial alcohol, ether, etc
- Ammonia, caustic soda liquor, potash liquor, brine, salt solutions, calcium chloride solutions, and other alkalis
- Certain concentrations of sulphuric and nitric acids, mixed or separate
- Animal and vegetable oils, soap, glycerine, glycerine water, and various soap factory wastes
- Paper stock, pulp, waste liquors, etc., in pulp and paper mills.

### WHAT WROUGHT IRON PIPE IS

Considerable confusion still exists between the terms "wrought pipe" and Wrought Iron Pipe. Wrought Iron Pipe is a definite term designating the product of the puddle furnace, and is a high grade quality

product. "Wrought Pipe" is an indefinite term used as a nom de plume for ordinary steel pipe—produced by the Bessemer or Open Hearth processes.

Contrary to the definite and logical terminology as adopted by the National Society for Testing Materials, the National Pipe and Supplies Association, and such publications as the IRON AGE and the IRON TRADE REVIEW, certain manufacturers still insist on selling their ordinary steel pipe under the misleading term, "wrought pipe." Engineers who specify wrought iron pipe for its far more satisfactory service and greater ultimate economy, should carefully examine the pipe supplied. Two simple but accurate tests are given elsewhere in these pages.

### WHY WROUGHT IRON IS BETTER THAN STEEL FOR MAKING WELDED PIPE

The primary requisites for good pipe are corrosion-resistance, uniformity, sound welds, and good threading qualities. Reading Wrought Iron Pipe possesses all four of these characteristics to a maximum degree. During refinement by the puddling process, wrought iron receives as an inseparable component, a corrosion-resisting basic silicate of protoxide of iron, known as slag. Subsequent rolling and rerolling of the metal elongates and thoroughly distributes this slag content into minute threads or filaments which group the grains into clusters and give to Reading Wrought Iron its characteristic fibrous structure. In the Bessemer or Open Hearth processes, by which steel is made, the production of a siliceous slag is impossible, and steel is therefore totally lacking in this protecting content which is largely responsible for the superiority of Reading Wrought Iron Pipe.

Wrought Iron gives two to three times the length of service of steel pipe; its incorrodible siliceous slag fibers resist corrosion and greatly retard its progress through the metal. Steel, having no protecting slag content, offers to corrosion an unobstructed path from surface to surface.

Wrought Iron gives sound welds; its slag content is a natural flux, totally lacking in steel.

Wrought Iron is uniform in structure. The continual agitation and rolling during its refining and cooling stages renders impossible the segregation of impurities that characterizes steel, and is responsible for the known irregularity of steel pipe in actual service.

Wrought Iron cuts and threads more easily and cleanly. Because of its uniform, fibrous structure, wrought iron does not require special dies, nor do standard dies gouge or burr the threads.

Wrought Iron is vastly more economical. Its somewhat higher initial cost buys two or three times the life of steel—a genuine ultimate economy, since failure of the pipe means replacement of the entire system, including labor costs, haulage, valves, fittings, etc.

*Continued on Next Page*

**TWO TESTS FOR WROUGHT IRON PIPE**

**The Acid Test.**—After removing all marks of the cutting off tool, and being sure that the end of the pipe is smooth, suspend it so that the end will dip into a solution of 10 parts water and 4 parts sulfuric acid (specific gravity), taking the usual precaution of pouring the acid very slowly into the water. A mixture of, say,  $\frac{1}{2}$  ounce of  $\frac{1}{4}$  ounce water is about right. Keep the pipe immersed for one hour. Wash off the acid after removing the pieces to be tested and dry quickly with a soft rag.

If the pipe is steel the end will have been eaten by the acid until it is smooth. If wrought iron, the end will show ridges or ridges indicating the great resistance of the siliceous slag content.

**The Manganese Test.**—Place in a small clean test tube a small chip of size of a large pinhead, or flings equal in bulk to this. Add drops of chemically pure nitric acid (specific gravity 1.2), until the chip with a match until the metal is completely dissolved. Let the solution cool till the tube can be held in the hand without discomfort, and add as much sodium bismuthate as will lie on the point of a penknife blade, or as much more as may be required to give a small amount of brown residue. Bubbles of oxygen gas given off by the solution when the bismuthate is added, after a pink or red color may appear in the solution, indicating the presence of manganese, which shows that the material is steel. If no color appears, or only a very slight pinkish discoloration is seen, the material is iron.

**SPECIFICATIONS FOR READING GUARANTEED GENUINE WROUGHT IRON STANDARD WELDED PIPE**

**1 Material.**—Lapweld and Butt-weld pipe is to be made of guaranteed quality Genuine Wrought Iron made from No. 1 Gray Forge Pig Iron, by the process of puddling, and no scrap or cuttings except scrap ends from the sheet or crop ends of the pipe itself shall be used in the manufacture. The use of steel scrap will not be permitted to enter into any part of the process of manufacture of the iron.

**2 Process of Manufacture.**—All pipe must be made either by the lapweld or butt-weld process. Sizes  $\frac{1}{2}$  inch and smaller, standard and special sizes, are Butt-weld. All 2 inch and larger standard and special sizes are made Lapweld.  $\frac{1}{4}$  inch and  $\frac{1}{2}$  inch are made Lapweld when specified. All in accordance with the best methods and practice.

**3 Surface Inspection.**—All pipe must be reasonably straight and free from blisters, cracks, or other injurious defects. Liquor marks incidental to manufacture of the pipe will not be considered as surface defects. The pipe shall not vary more than  $\frac{1}{2}$  inch either way from being perfectly round or true to size, outside diameter, except on the

small sizes where a variation of 1.64 inch will be accepted. The pipe must not vary more than 2½% below or 5% above standard weight.

**4 Threading and Reaming.**—All pipe must have a good Briggs' Standard thread, which will make a tight joint when tested by hydrostatic pressure at mill (See Tests). The thread must not vary more than one and one-half turns either way when tested with a Pratt & Whitney standard gauge.

**5 Internal Pressure Test.**—The following hydrostatic test pressures must be applied to the respective sizes of standard Butt-weld and Lapweld pipe as indicated in table.

Nominal Size	Method of Manufacture	Test Pressure Pounds
$\frac{1}{2}$ inch to $1\frac{1}{2}$ inch (inclusive)	Butt-weld	750
$1\frac{1}{2}$ inch and 2 inch	Lapweld	1000
2 inch and 3 inch	Lapweld	900
3 inch and 4 inch	Lapweld	800
4 inch and 6 inch	Lapweld	700
6 inch O. D.	Lapweld	600
17 inch O. D. 18 inch O. D. and 20 inch O. D.	Lapweld	550

All specials, or weights other than standards to be tested specially.

**6 Testing of Materials.** The iron from which the pipe is made must show the following physical properties:

Tensile strength.	45,000 pounds to 50,000 pounds
Elastic limit.	25,000 pounds to 30,000 pounds
Elongation 8 inches.	15% to 25%
Reduction of area.	17% to 25%

**7 Couplings.**—The material is to be made from No. 1 Gray Forge Pig Iron by the process of puddling, and no scrap or cuttings, except scrap ends from the sheet or crop ends from the pipe itself, shall be used in the manufacture. The material must be sound and free from injurious defects for Standard Pipe Couplings. Threads must be clean cut, tapered straight through and of such pitch diameter as will make tight joint, the ends must be countersunk. Couplings for Oil Country Goods must be made from Double Redefined Wrought Iron. All Standard Pipe Couplings larger than  $\frac{1}{2}$  inch, and all Oil Country Couplings must be full taper tapered on each end, faced and recessed.

**8 Thread Protection.** Full length tapered rings or split couplings must be provided as thread protection on all sizes, 4 inch diameter or larger. Protectors must be provided for small sizes when specifically called for on order. On all Oil Country goods the threads must be protected with heavy rings or split couplings.

**9. All tests shall be made at the mill.**

**READING STANDARD GENUINE WROUGHT IRON PIPE, BLACK AND GALVANIZED**

Size	DIAMETERS		Thickness	WEIGHT PER FOOT		Threads per inch	Length of Thread per foot	Hydrostatic Test
	External	Internal		Plain Ends	Threads & Couplings			
Butt-weld	$\frac{1}{2}$	.405	.266	.244	.245	27	$\frac{1}{2}$	750
	$\frac{3}{4}$	.440	.260	.324	.325	18	$\frac{1}{2}$	750
	$\frac{1}{2}$	.475	.280	.367	.368	18	$\frac{1}{2}$	750
	$\frac{3}{4}$	.510	.317	.410	.411	14	$\frac{1}{2}$	750
	$\frac{1}{2}$	.550	.349	.450	.451	14	$\frac{1}{2}$	750
	$\frac{3}{4}$	.585	.386	.495	.496	11½	$\frac{1}{2}$	750
	$\frac{1}{2}$	.625	.418	.540	.541	11½	$\frac{1}{2}$	750
	$\frac{3}{4}$	.665	.450	.580	.581	11½	$\frac{1}{2}$	750
	$\frac{1}{2}$	.705	.482	.620	.621	11½	$\frac{1}{2}$	750
	$\frac{3}{4}$	.745	.514	.660	.661	11½	$\frac{1}{2}$	750
Lapweld	$\frac{1}{2}$	.465	.276	.271	.272	27	$\frac{1}{2}$	1000
	$\frac{3}{4}$	.500	.311	.316	.317	18	$\frac{1}{2}$	1000
	$\frac{1}{2}$	.535	.346	.351	.352	18	$\frac{1}{2}$	1000
	$\frac{3}{4}$	.570	.381	.386	.387	14	$\frac{1}{2}$	1000
	$\frac{1}{2}$	.605	.416	.421	.422	14	$\frac{1}{2}$	1000
	$\frac{3}{4}$	.640	.451	.456	.457	11½	$\frac{1}{2}$	1000
	$\frac{1}{2}$	.675	.486	.491	.492	11½	$\frac{1}{2}$	1000
	$\frac{3}{4}$	.710	.521	.526	.527	11½	$\frac{1}{2}$	1000
	$\frac{1}{2}$	.745	.556	.561	.562	11½	$\frac{1}{2}$	1000
	$\frac{3}{4}$	.780	.591	.596	.597	11½	$\frac{1}{2}$	1000
	$\frac{1}{2}$	.815	.626	.631	.632	11½	$\frac{1}{2}$	1000
	$\frac{3}{4}$	.850	.661	.666	.667	11½	$\frac{1}{2}$	1000
	$\frac{1}{2}$	.885	.696	.701	.702	11½	$\frac{1}{2}$	1000
	$\frac{3}{4}$	.920	.731	.736	.737	11½	$\frac{1}{2}$	1000
	$\frac{1}{2}$	.955	.766	.771	.772	11½	$\frac{1}{2}$	1000

Furnished with threads and couplings and in random lengths unless otherwise ordered.

All weights given in pounds. All dimensions given in inches. All weights and dimensions are nominal.

The weight per foot of pipe with threads and couplings is based on a length of 20 feet, including the coupling, but shipping lengths of small pipe will usually average less than 20 feet.

Possible variation in weight is 2½% below and 5% above weights shown in tables.

All weights figured on the basis of 1 cu. in. Wrought Iron weighing 4.9 lbs.

All pipe threaded to Briggs' Standard Gauges as made by Pratt & Whitney Co., Hartford, Conn.

For cut lengths an extra charge will be made above random lengths.

For pipe smoothed on the inside known as plugged and reamed, an extra charge will be made above Standard Pipe.

For Galvanized or Coated Pipe an extra charge will be made above Black.

When ordering sizes 8 inch to 12 inch please state weight of pipe wanted.

**READING X HEAVY AND XX HEAVY GENUINE WROUGHT IRON PIPE, BLACK AND GALVANIZED**

Size	DIAMETERS		Thickness	Weight per Foot Plain Ends	Hydrostatic Test
	External	Internal			
Butt-weld	$\frac{1}{2}$	.405	.210	.314	750
	$\frac{3}{4}$	.440	.225	.359	750
	$\frac{1}{2}$	.475	.240	.404	750
	$\frac{3}{4}$	.510	.255	.449	750
	$\frac{1}{2}$	.545	.270	.494	750
	$\frac{3}{4}$	.580	.285	.539	750
	$\frac{1}{2}$	.615	.300	.584	750
	$\frac{3}{4}$	.650	.315	.629	750
	$\frac{1}{2}$	.685	.330	.674	750
	$\frac{3}{4}$	.720	.345	.719	750
Lapweld	$\frac{1}{2}$	.465	.226	.363	1000
	$\frac{3}{4}$	.500	.241	.408	1000
	$\frac{1}{2}$	.535	.256	.453	1000
	$\frac{3}{4}$	.570	.271	.498	1000
	$\frac{1}{2}$	.605	.286	.543	1000
	$\frac{3}{4}$	.640	.301	.588	1000
	$\frac{1}{2}$	.675	.316	.633	1000
	$\frac{3}{4}$	.710	.331	.678	1000
	$\frac{1}{2}$	.745	.346	.723	1000
	$\frac{3}{4}$	.780	.361	.768	1000
	$\frac{1}{2}$	.815	.376	.813	1000
	$\frac{3}{4}$	.850	.391	.858	1000
	$\frac{1}{2}$	.885	.406	.903	1000
	$\frac{3}{4}$	.920	.421	.948	1000
	$\frac{1}{2}$	.955	.436	.993	1000

Extra Strong and Double Extra Strong pipe will be shipped in random lengths and with plain ends unless otherwise ordered.

All weights given in pounds. All dimensions given in inches. All weights and dimensions are nominal.

Random lengths X Strong and XX Strong considered to be 12 to 20 ft.

If fitted with threads and couplings an extra charge will be made above regular. When X Strong and XX Strong is ordered with threads and couplings, regular Line Pipe Couplings will be furnished, unless otherwise specified.

For cut lengths, an extra charge will be made above random lengths. For Galvanized or Tar Coated Pipe, an extra charge will be made above Black.

All Double Extra Strong Pipe made from a solid sheet, not telescoped.

# READING VALVE AND FITTINGS CO.

Pratt and Cady Division  
HARTFORD, CONN.

## PRODUCT

Bronze and Iron Valves for All Services.

### BRONZE GLOBE AND ANGLE VALVES

**Renewable Disc Type**—Made in sizes  $\frac{1}{8}$ " to 3" inclusive in two weights suitable for 150 and 250 pounds steam pressure respectively. Both weights are made with screwed hubs and the 150 pound line is also made with a union bonnet. The 150 pound lines have the well-known P&C renewable asbestos disc; the 250 pound line has a renewable solid bronze disc and renewable seat ring.

**Regrinding Type**—Made in sizes  $\frac{1}{8}$ " to 3" inclusive in three weights suitable for 200, 250, and 300 pounds steam respectively.

These valves are of the regrinding type and carry certain special features which make them particularly suitable for severe service. The 300 pound line can be equipped with renewable seat rings when so ordered.



Fig. 9

### IRON BODY GLOBE AND ANGLE VALVES

Made in two styles, one with renewable asbestos disc for 150 pounds steam and the other with 45° seat, in two weights, 150 and 250 pounds steam respectively.

The renewable asbestos disc type is made in sizes 2" to 14" inclusive.

The 45° seat valves are made in sizes 2" to 10" inclusive.

These valves are all built with renewable seat rings, can be packed under pressure and all parts renewed without taking the valve from the pipe line.



Fig. 55

### BRONZE GATE VALVES

Made in all sizes and in five weights suitable for 125 pounds steam, 150 pounds steam, 175 pounds steam, 250 pounds steam and 800 pounds water respectively. The 150, 250 and 800 pound lines have renewable seat rings which can be changed without removing the valve from the line.

All P&C gate valves are equipped with double faced bronze wedges which permit the pressure to be applied upon either side and are reversible.

### IRON BODY WATER GATE VALVES

Sizes 3" to 24" for 125 to 150 pounds working pressures, 14" to 24" for 75 to 100 pounds working pressure, and 10" to 24" for 35 to 75 pounds working pressures. We also make high pressure hydraulic valves for 800 and 1500 pounds working pressure respectively in sizes  $1\frac{1}{2}$ " to 8". These valves are bronze trimmed. In opening, one turn of the spindle releases the wedge in the gate, allowing the valve to open freely, without friction. Furnished with inside screw or with outside screw and yoke.



Fig. 187

### SWING CHECK VALVES

Bronze and Iron.

Bronze swing check valves made in sizes  $\frac{1}{8}$ " to 3" inclusive for all pressures and purposes.

Iron body swing check valves made in sizes 2" to 24" inclusive for 150 pounds water; sizes 3" to 12" inclusive conform to Fire Underwriter's specifications. We also make a line suitable for 300 pounds water in sizes 2" to 12" inclusive. Working parts for any of these valves can be renewed or the disc reground without removing the valve from the line. The only tools necessary for regrinding are a wrench and brace and bit.



Fig. 220

Made in screwed, flanged or bell ends.

### IRON BODY GATE VALVES

Made in 2" to 16" sizes for 125 pounds, 150 pounds and 200 pounds steam working pressure and 2" to 24" sizes for 250 pounds steam working pressure. The 125 pound line will be furnished built to Underwriter specifications if desired. All the valves are bronze trimmed and have bronze faced solid wedges except the 125 pound valves, which can be furnished with a new design of split wedge, so made as to have the advantages, but not the disadvantages usual to a split wedge. These valves are made in the inside screw, outside screw and yoke and quick opening type and with screwed, flanged or bell ends.



Fig. 125

### ASBESTOS PACKED COCKS

Bronze and Iron.

Bronze cocks in sizes  $\frac{1}{4}$ " to 4" for 150 and 250 pounds steam working pressures respectively.

Iron cocks in sizes  $\frac{1}{4}$ " to 4" for 100 to 125, 150 to 200, and 250 pounds steam working pressures respectively. Also made in sizes up to 10" for the various pressures, with worm gear operating attachment.

The dove-tailed "U" shaped grooves in the body are packed with prepared asbestos and afterwards subjected to a special vulcanizing process. An asbestos ring is used on the shoulder of the plug for top packing. The plug is carefully finished and barfed to make it rust proof. It has no metallic bearing, coming in contact only with the asbestos which compensates for the differential expansion of the plug and body.

These cocks give excellent results as boiler blow-off valves and on other severe services where other types of valves fail.

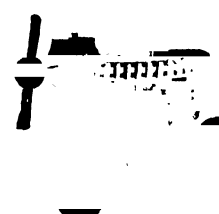


Fig. 359



# READING VALVE AND FITTINGS CO.

Manufacturers of  
Cast Steel Valves, Fittings and Flanges and Bronze and Iron Valves  
READING, PA.

London      Hartford      New York      Philadelphia      Pittsburgh  
Detroit      St. Paul      San Francisco      Cleveland      Houston

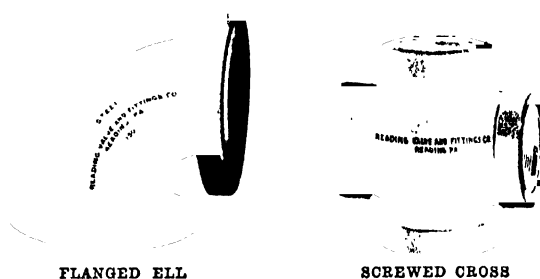
## Reading Division

### PRODUCTS

Acid Open Hearth Cast Steel Valves, Flanges and Fittings for All Temperatures and Pressures.

### READING STEEL

The merits of the several methods and combinations of methods of steel making were carefully weighed by our engineers before it was decided to install acid open hearth furnaces to make the steel for Reading Cast Steel Valves, Fittings and Flanges. The open hearth process permits of taking frequent samples for analysis during the heat and of close control, resulting in uniformity of the steel, and the acid furnace yields a steel with a minimum of occluded gases, and therefore greatest freedom from gas bubbles and porosity.



FLANGED ELL

SCREWED CROSS

### EXPERIENCE

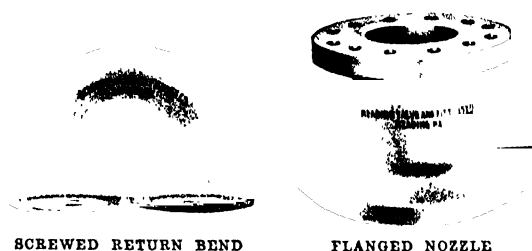
The Reading Foundry has, throughout its existence, been exclusively a steel casting plant and for several years has specialized on pressure castings. It was early discovered that the molding practise is of primary importance in this class of work and intensive study has resulted in advanced methods, particularly to secure proper venting of the molds and to make proper provision for shrinkage. Experience has also led us to thoroughly anneal every flange and fitting.

### APPLICATION

Reading Cast Steel Valves, Fittings and Flanges are essential for services involving high pressures and temperatures or sudden reversals of temperature, not only because of its great strength, but more particularly because of the perfect elasticity and reliability of the steel. Up to 800° F. the elasticity and reliability are unimpaired and the loss in strength is so small as to leave large factors of safety at the maximum working pressures specified.

These flanges and fittings are recommended for all superheated steam piping, for oil, asphalt and other stills, for steam jacketed kettles, hot oil jacketed kettles, autoclaves, hydraulic presses, refrigerating equipments, condenser coils, etc.

Standard cast steel fittings are made on the same patterns as standard cast iron fittings, but are good for all the services of extra heavy cast iron.



SCREWED RETURN BEND

FLANGED NOZZLE

### PROPERTIES OF READING CAST STEEL FLANGES AND FITTINGS

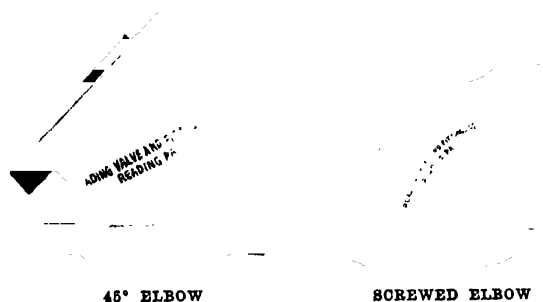
Class	Type	Steam Working Pressure	Cold Water or Oil Working Pressure No Shock	Cold Water or Oil Working Pressure With Shock	Test Pressure
Standard	Flanged & Screwed	250	500	250	1000
Medium	Flanged	250	500	250	1000
Extra Heavy	Flanged & Screwed	350 350	600 1200 to 1500	350 400	1200 1800 to 1250
800 lb. Hydraulic	Flanged	-	800	500	1200
1200 lb. Hydraulic	Flanged	-	1200	800	1800
3000 lb. Hydraulic	Flanged & Screwed	-	3000	2000	4500
6000 lb. Hydraulic	Screwed	-	6000	4500	6000

Medium cast steel fittings have the same metal wall and flange thicknesses as the standard, but the face to face, flange diameter and bolting are the same as extra heavy cast iron fittings. They are designed for replacement of extra heavy cast iron fittings.

The fittings are all good for the steam pressures specified for temperatures up to 800° F. and for these pressures in hot oil or other liquids or gases.

### READING STEEL VALVES

Cast steel gate valves, globe and angle valves, check valves and stop and check valves are made for saturated steam service up to 250 lbs. pressure, and for superheated steam service up to 350 lbs. pressure, and for a total temperature up to 800° F. The 350 lbs. steam pressure valves are for 800 lbs. cold water or oil pressure and we also make hydraulic valves for 1500 lbs. and 3000 lbs. working pressure.



45° ELBOW

SCREWED ELBOW

# REDMANOL CHEMICAL PRODUCTS CO.



648 West 22nd Street  
CHICAGO, ILL.



## PRODUCTS

- "Redmanol" Molding Compounds.
- "Redmanol" Electric Insulation.
- "Redmanol" Acid-Proof Paints.
- "Redmanol" Fume-Proof Paints.
- "Redmanol" Transparent (Synthetic Amber).
- "Redmanol" Impregnating Liquids.
- "Redmanol" Insulating Varnishes.
- "Redmanol" Metal Lacquers.
- "Redmanol" Bristle Set Cements.
- "Redmanol" Cements.

## "REDMANOL"

"Redmanol" is the synthetic phenol resin which forms when phenol reacts with hexamethylenetetramine in an anhydrous reaction.

## PROPERTIES OF "REDMANOL"

- Resistance to extreme heat.
- Exceptionally high dielectric strength.
- Great mechanical strength.
- Excellent acid resistance.
- Unusual accuracy of dimensions.
- Singular beauty of finish.

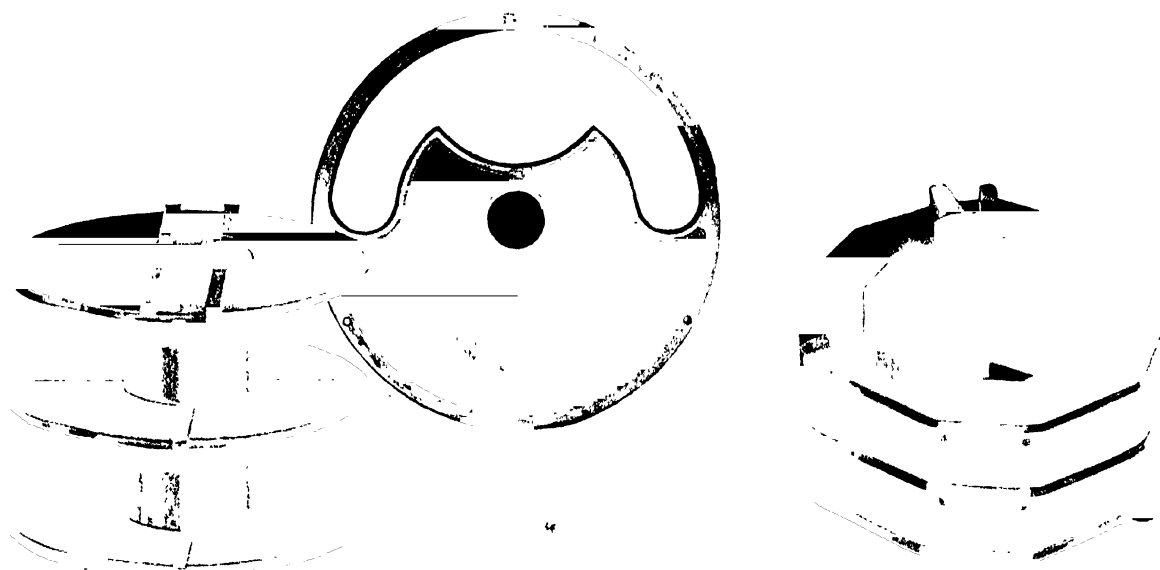
## APPLICATIONS

The parts illustrated show only a few of the many applications of "Redmanol."

"Redmanol" is being used today by makers of motor cars, airplanes, wireless telegraph apparatus, telephone equipment, electrical measuring instruments, scientific instruments, billiard balls, umbrella handles, pipes, cigar and cigarette holders, novelties, buttons, etc.

On account of its perfect qualities as a molding compound, notable savings in cost of production are possible through its use. "Redmanol" can often be used to replace parts now requiring careful hand machining and finishing.

Many more manufacturers could advantageously use "Redmanol." Why not get in touch with our laboratories—which are constantly working on new applications—and find out if some of **your** problems cannot be simplified by "Redmanol"? For this service there is no charge.



MOLDED "REDMANOL" PARTS

# THE REFINITE COMPANY

Water Rectification

U. S. PATENT AND WORKS REFINITE BUILDING, OMAHA, NEBRASKA EQUIPMENT ASSEMBLING PLANT  
Omaha, Neb.

Member Associated Manufacturers of Water Purifying Equipment

DISTRICT OFFICES

Chicago, 904 S. Michigan Ave.  
(Special Display Salesroom)

San Francisco, 419 Call Bldg

## PRODUCTS

Refinite, Nature's Water Softener (zeolite system). Booth Lime-Soda Water Softener. Refinite Rapid Pressure Filter, Gravity Filter. REFINITE SYSTEMS

**REFINITE**  
RIVAL OF THE CLOUDS  
TRADE MARK

Nature's Water Softener  
Copyright 1920—The Refinite Co.

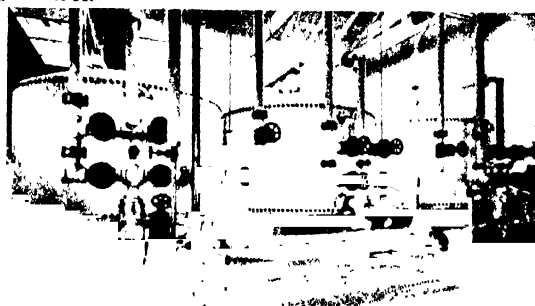
prevents boiler scale, conserving fuel and saving time, labor and equipment. It is used also in tanneries, ice plants, machine shops, food factories, cafes, beauty parlors and homes.

The Refinite system utilizes as a softening agent Refinite, a natural water softening mineral. It attaches to the water supply line. Softening is accomplished as the water passes downward through a bed of Refinite in the container, sodium from the mineral exchanging with the calcium and magnesium hardness. The effluent is zero hardness and free from causticity.

**Renewal**—The sodium base of the mineral, when exhausted, is renewed by introducing salt water into the container. The renewal action is the reverse of the softening, sodium from the salt solution exchanging with the calcium and magnesium hardness taken up by the mineral. For industrial uses the systems are built to soften the maximum amount of water needed. Renewal is accomplished over night. The brine solution is then flushed out and the system again ready for a capacity run of soft water.

Refinite systems are built in sizes to suit all needs. Two or more units may be connected to increase the total capacity. They occupy very little space. Dependable and accurate in performance. No expert supervision is required; practically no attention; inexpensive to operate; the mineral does not disintegrate.

Refinite Water Softeners are ideal for textile mills and are highly approved by such users as Phoenix Knitting Works, Burson Knitting Mills, Standard Processing Co., Samuel Hird & Son, Hanover Woolen Mills, Pennsylvania Silk Co., California Cotton Mills and many others. Refinite soft water saves more than half the soap in laundries and the laundry department of hotels, hospitals, institutions and similar users. It



THREE UNIT REFINITE INSTALLATION IN A SAN FRANCISCO, CALIF., LAUNDRY

## REFINITE RAPID PRESSURE FILTER, GRAVITY FILTER

Standard types built in sizes to suit individual needs. Used for removal or reduction of impurities and substances other than calcium and magnesium.

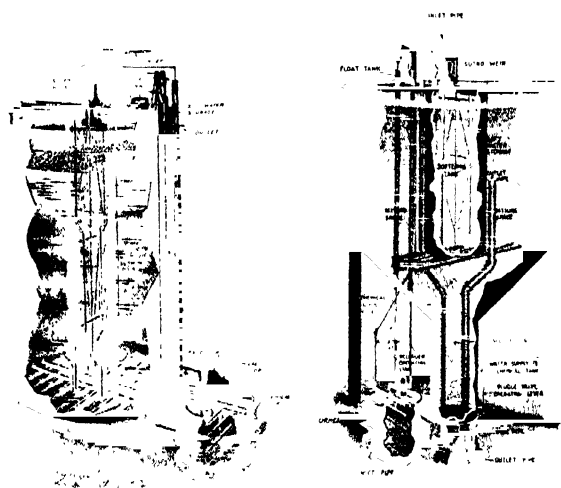
## BOOTH LIME-SODA WATER SOFTENERS

Continuous type, using milk-of-lime and soda ash. Capacities ranging from 500 gals. per hour upward. Used extensively by railroads and the larger steam power and central heating plants. It is built in two styles, flat bottom and conical-spherical tank. The Booth system is the first water softener ever built where continuous feeding and proportional regulation of chemicals are accomplished at the ground level. Large softening tank, ample sedimentation tank. Chemical reagent tank holds supply for 14 hour run at

maximum speed; agitators prevent lime from setting. Chemical feed regulator controlled by flow of incoming water, and measures uniform amount of chemical solution regardless of fluctuations in supply or use of water. Operating power obtained from incoming water passing over an overshot wheel or from electric motor, gas or steam engines.

## GUARANTEES, LITERATURE

Each Refinite or Booth installation is built and installed to give absolute satisfaction, to accomplish definite results at a definite cost, and each sale is conditioned on the apparatus fulfilling these guarantees. A staff of competent chemists and engineers is maintained to work with prospective purchasers. Water analysis, investigations, estimates, reports and designs furnished for industrial and municipal softening or purifying plants. Full descriptive literature furnished on request.



SECTIONAL VIEW OF BOOTH FLAT BOTTOM TYPE AND OF BOOTH CONI-SPHERICAL TYPE WATER SOFTENER

# RELIANCE ELECTRIC & ENGINEERING COMPANY

Established 1905

MAIN OFFICE AND WORKS

1060 IVANHOE ROAD, CLEVELAND, OHIO



Boston, 200 Devonshire St.  
 New York, 16 Day St.  
 Philadelphia, Pennsylvania Bldg.

BRANCHES

Pittsburgh, 414 House Bldg.  
 Cincinnati, 1700 Union Trust Bldg.  
 Detroit, 604 Temple Bldg.  
 Chicago, 143 S. Dearborn St.

## PRODUCTS

Direct Current Motors  
 Direct Current Generators up to 100 k.w.  
 Alternating Current Motors 2 and 3 phase  
 Motor-Generator Sets

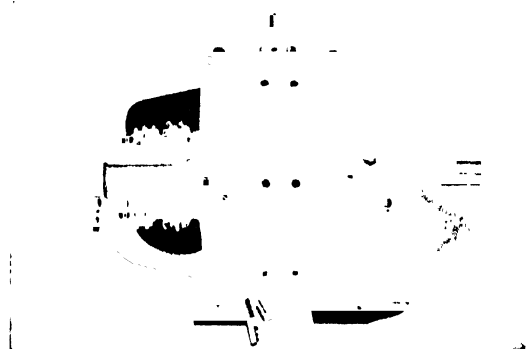
We shall be glad to submit complete evidence of the quality of materials and workmanship in Reliance Motors and the satisfaction which they are giving in many large industrial plants.

## TYPE T HEAVY DUTY RELIANCE MOTORS

For Direct-Current. Constant and adjustable speed duty.

Thirty-five electrical engineers who have watched motors operating under the worst conditions co-operated with us in the design of Type T motors. The result of this unusual combination of engineering knowledge is a motor that will stand harder work and stand it longer than the ordinary motor. The added strength and quality built into Type T motors make them particularly suited for operation in plants where the service is severe and the operating conditions unfavorable.

These motors are built in sizes up to 150 h.p. They can be supplied open, semi-enclosed or fully-enclosed and with shunt, compound or series windings. Rated on 40°C. basis.

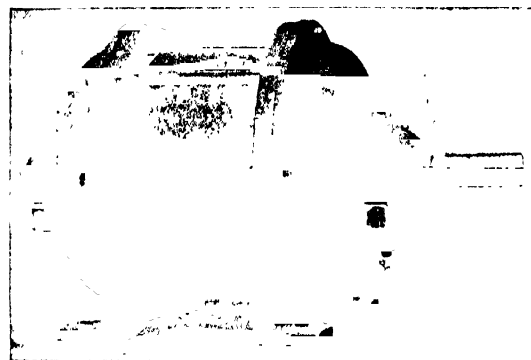


TYPE T HEAVY DUTY D. C. MOTOR

## RELIANCE INDUCTION MOTORS

Unusual care is taken in preparing the windings of Reliance Motors to resist the destructive action of dust, moisture, oil and acids. This extra precaution is a big factor in insuring continuous and satisfactory operation in chemical plants, textile mills, paint factories and for all pumping service.

Motors are supplied for two and three phase circuits in both squirrel cage and slip ring types. All standard voltages, frequencies, and speeds.



TYPE AA SQUIRREL CAGE INDUCTION MOTOR

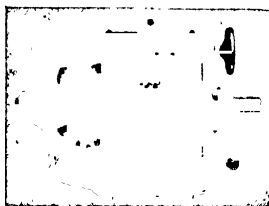
## MOTOR-GENERATOR SETS

These sets can be furnished for battery charging, lighting and general power purposes in sizes up to 100 k.w.

## TYPE A S RELIANCE ADJUSTABLE SPEED MOTORS

Armature Shifting Design. For Direct Current.

These motors provide unlimited running speeds over ranges as great as 1:10. Changes in speed are obtained by shifting the motor armature. No electric controller is used. Horse-power output is same at all speeds. These motors are particularly suited for work requiring accurate speed adjustments over wide ranges. Sizes up to 40 h.p.



TYPE A S ADJUSTABLE SPEED MOTOR



A. C.—D. C. MOTOR-GENERATOR SET

# RESEARCH CORPORATION

Engineers, Consultants, Constructors  
Cottrell Electrical Precipitation Processes  
25 WEST 86 STREET, NEW YORK, N. Y.

111 S. DEARBORN STREET, CHICAGO, ILL.

## SERVICE

Design, construct, install and license installations of the Cottrell Electrical Precipitation Processes for the removal and collection of dust, fumes, acid mist, tar, etc., from air and other gases.

Make investigations and reports on dust and fume losses in metallurgical, chemical, and other manufacturing plants.

Render consulting and general engineering services for plant or process design and construction.

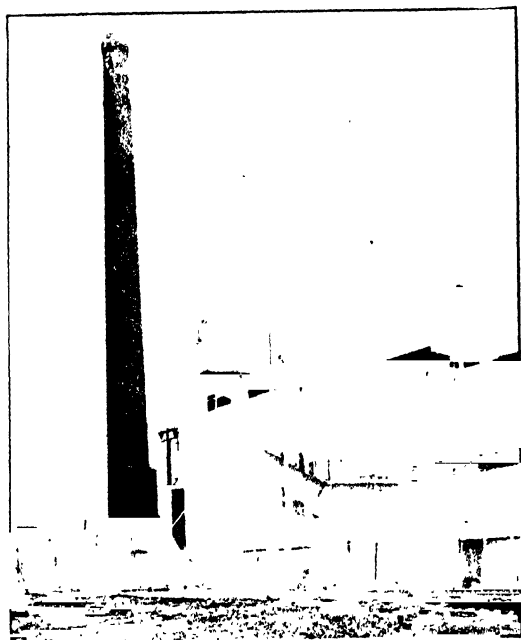
Investigate and develop new processes in cooperation with inventors, patentees, etc.

## INDUSTRIAL ENGINEERING

We design and construct parts of or complete plants for various industrial purposes—metallurgical plants, oil refining, sulphur dioxide removal, acid recovery, ventilating, etc.

## NEW PROCESSES

Research Corporation is organized to investigate and exploit new and undeveloped processes cooperatively with the inventors and industry.



**COTTRELL PRECIPITATOR REMOVING DUST AND FUMES FROM TIN DROSS FURNACE GASES**  
Constructed by Research Corporation

## COTTRELL PROCESSES

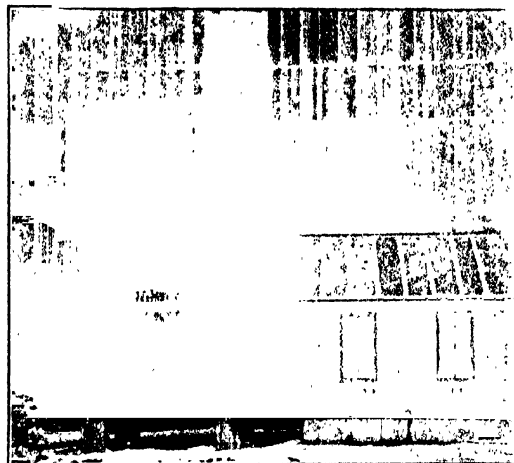
The Research Corporation owns and controls the rights to the Cottrell Electrical Precipitation Processes throughout the United States, excepting the six Western States of Washington, Oregon, California, Idaho, Nevada and Arizona, and with the exception of the

application of these processes in Portland Cement factories throughout the country.

We design and construct plants, furnish and install all apparatus necessary for use with the Cottrell Electrical Precipitation Processes for a contract price. All such installations are licensed by Research Corporation.

If deemed desirable, small scale tests can be made prior to the erection of a commercial installation, for which purpose we rent clients the necessary electrical equipment and furnish an engineer for making such tests. Fees for such services will be quoted on request.

Address all communications to Research Corporation, Attention of Precipitation Department



**COTTRELL PRECIPITATOR REMOVING ACID MIST FROM CONCENTRATOR GASES**  
Constructed by Research Corporation

## TYPICAL APPLICATIONS

Collecting and recovering fumes and dust from the gases from: Sintering machines, reverberatory smelting and refining furnaces, lead and copper blast-furnaces copper converters, drying, roasting and calcining kilns, brass-melting furnaces, etc.

Cleaning iron blast-furnace gas, recovering potash, manganese and other values.

Cleaning gases from electric furnaces producing carbide and ferro-alloys.

Removal of tar and oils from producer, coke-oven and illuminating gas, wood distillation, etc.

Removing acid mists and fumes from gases given off by:

Sulphuric acid concentrators, sludge acid concentrators, nitrating operations, pickling vats, etc.

Cleaning hot gases from pyrites and zinc blends roasting furnaces for sulphuric acid manufacture.

Cleaning air drawn from buildings and rooms in which grinding, buffing and similar operations are carried on as well as from tumbling barrels and sand-blast rooms in foundries.

Recovering powdered food products from spray evaporating processes, etc.

# RICE & ADAMS CORPORATION

Manufacturers of Power Washing Machinery

Main Office and Factory  
BUFFALO, N. Y.

SALES OFFICES  
New York Boston Chicago

## PRODUCTS

Power washing machinery for all kinds of containers and utensils used in the handling of chemicals and allied products, designed and built to your special order providing they come within the limits of size. Among the purposes for which Rice & Adams Power Washing Machinery have been built are the following:

- Medicine bottles
- Battery jars
- Metal Parts washers
- Aluminum Ware washers
- Garbage can washers
- Chocolate Molds
- Biscuit tins
- Preserve jars
- Catsup bottles
- Salad bottles
- Ice Cream cans
- Water bottles
- Beverage bottles
- Milk bottles
- Milk cans

## PROCESS

In Rice & Adams Power Washing Machinery the bottles, cans or containers are first washed with washing solution under hydraulic pressure, rinsed with boiling hot water, sterilized with live steam and thoroughly dried with blasts of hot air.

## USERS

- U. S. Aluminum Company
- Electric Storage Battery Co.
- United Drug Company
- Loose-Wiles Biscuit Company
- Libby, McNeil & Libby
- Armour Packing Company
- Van Camp Packing Company
- Nestlé's Food Company
- Borden's Condensed Milk Company
- Walter Baker Chocolate Company

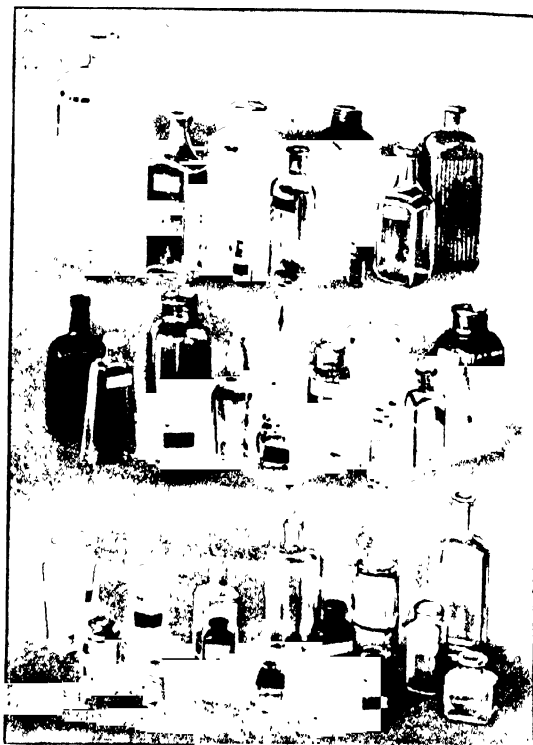


ONE OF THE TYPES OF RICE & ADAMS POWER WASHING MACHINES

## EXPERIMENTAL DEPARTMENT

Our experimental department will be glad to advise you if the bottle, can or container you have to wash can be successfully handled with a power washing machine. This department has designed widely different types of power washing machinery for various purposes. It has solved the washing problem for manufacturers in

other lines—helped them to obtain more sanitary containers—to reduce costs and save time. Maybe it can do the same for you.



A FEW SAMPLES OF THE 128 DIFFERENT TYPES OF BOTTLES WHICH ONE RICE & ADAMS MACHINE IS WASHING FOR THE UNITED DRUG COMPANY



SAMPLES OF ALUMINUM WARE WASHED BY A RICE & ADAMS MACHINE; USED BY THE U. S. ALUMINUM COMPANY

# RIEHLÉ BROS. TESTING MACHINE COMPANY

Established 1865

Tele Address  
Philadelphia

Manufacturers of Testing Machines

1424 N. 9TH STREET, PHILADELPHIA, PA., U. S. A.

FOREIGN REPRESENTATIVES  
France—Allied Machinery Co

Codes Used  
ABC 4th Edition  
Lieber's

and A Macklow-Smith

Spain—Puig & Co

## PRODUCTS

### Testing Machines, including:

Testing machinery and instruments for determining the physical characteristics of all materials. Universal testing machines, special testing machines for hardness, tension, impact, bending, and alternate stress testing. Special testing machines for cement, concrete, fabric, cloth, twine, paper, rubber, leather, oils, grease and bearing metal. Also testing machines for molded insulating material, springs, wire, rope, chain, anchors, iron, steel, road materials, etc. Special efficiency testing machines for determining the property of all tools. Special milling machines for preparing test specimens, pumps, viscosimeters, presses, accumulators, etc.

### EXPERIENCE AND FACILITIES

The Riehlé Bros. Testing Machine Company was founded in 1865. Its engineering staff has a broad and varied experience in the design and construction of testing machinery. The plant in Philadelphia is fully equipped for the production of standard and special testing machines of all kinds.

### TESTING LABORATORY AND RESEARCH DEPARTMENT

The Company's testing laboratory is located at the works in Philadelphia. It has been in operation since 1866, and is the oldest physical testing laboratory in the United States.

In this laboratory the Company is prepared to make all kinds of tests and investigations, and develop new methods of testing and suitable machines for the purpose.

Special problems requiring the development of new methods of testing and new designs of testing machines will be placed in the hands of expert engineers, who have had long experience in this class of work. As a large portion of the Company's business consists of designing and building special machines, it is often possible to meet usual requirements by slight alteration of an existing design.

Companies purchasing materials in the United States will find it advantageous to have tests of specimens made in the Riehlé laboratory. Carefully compiled confidential reports will be made on the results of such tests.

### USERS OF RIEHLÉ TESTING MACHINES

Riehlé testing machines are in use in the laboratories of many governments, universities, railroads, and manufacturing concerns in America and abroad. The following are a few of the users of Riehlé machines:

**U. S. Government**—Bureau of Standards; Isthmian Canal Commission; Navy Department; Naval Aircraft Factory

**Other Governments**—Argentina Republic; China, Government Institute of Technology; England, Royal Aircraft Factory; Japan, Osaka Military Arsenal and Yokosuka Navy Yard

**Technical Schools in the United States**—University of Illinois, Lehigh University, Massachusetts Institute of Technology, Johns Hopkins University, Yale University

**Technical Schools in Other Countries**—Australia, Sydney Technical College; Canada, Montreal Technical School, Uni-

versities of Alberta and Saskatchewan, England, City and Guilds College, Imperial Institute, Hightown Technical Institute, Croydon Polytechnic and the Verdun Technical School; Hawaii, College of Hawaii; India, College of Poona; Porto Rico, University of Porto Rico; Turkey, Robert College

### RIEHLÉ BROS. CATALOGS

The Riehlé Bros. Testing Machine Company build several hundred types and sizes of standard testing machines. For the convenience of prospective customers these machines have been grouped according to similarity, and a catalog issued for each class of equipment. Each catalog is given a code word so that prospective customers may request copies by cable.

**Catalog "A"**—Illustrates and describes all the larger standard testing machines, two rotating screw, three rotating screw, three rotating nut, and four rotating nut types of vertical screw power testing machines, with new and special appliances for use with them. Also hydraulic machines for tensile, compression and transverse strains and machines for torsion, impact, repeated stress, and cold bend strains. Brinell hardness machines, brake beam, staybolt testers and specimen millers. Code word: TESTMACHINE

**Catalog "AA"**—Extensometers, compressometers, torsion meters, deflectometers, etc. Code word: SUPDATA

**Catalog "B"**—Small machines for testing fabric, wire, twine, rubber, springs, etc. Code word: TESTCATWIRE

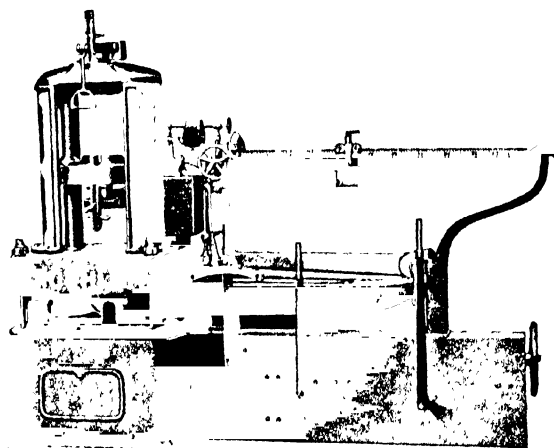


FIG 1—UNIVERSAL TESTING MACHINE

**Catalog "C"**—Machines for testing anchors, chain, wire, rope, eye-bars, etc. Code word: CHAINTM

**Catalog "D"**—Testing machines for foundries, transverse testers, pipe provers, hay rope twistors, etc. Code word: TESTCATRAN.

**Catalog "E"**—Testing machines for heavy springs used by railways, rapid testers for automobile springs, small machines for light springs, oil and bearing metal testers. Code word: SPRINGOILTM

**Catalog "F"**—Hand and power operated hydraulic pumps and presses, also Riehlé-Robie patented screw jacks, etc. Code word: CUTOOTHER

**Catalog "G"**—Machines and apparatus for testing cement and concrete, automatic shot cement testers, compression and transverse machines, molds, sieves, and laboratory equipment. Code word: CEMASPTM

**Catalog "K 1"**—Illustrates and describes complete outfits for making laboratory tests on road materials as used by the U. S. Government Department of Public Roads. Code word: GOVEMTR.

# H. H. ROBERTSON COMPANY

PITTSBURGH, PA.

## FACTORIES

Ambridge, Pa., Waltham, Mass., Akron, N. Y., Sarnia, Ont.

## BRANCH OFFICES

Allentown, Pa.  
Baltimore, Md.  
Birmingham, Ala.  
Boston, Mass.  
Buffalo, N. Y.  
Chicago, Ill.

Cleveland, Ohio  
Dayton, Ohio  
Denver, Colo.  
Detroit, Mich.  
Duluth, Minn.  
Easton, Pa.

Indianapolis, Ind.  
Little Rock, Ark.  
Minneapolis, Minn.  
Nashville, Tenn.  
New York, N. Y.  
Philadelphia, Pa.

Portland, Ore.  
San Francisco, Cal.  
Scranton, Pa.  
Seattle, Wash.  
St. Louis, Mo.

EXPORT DIVISION 170 Broadway, NEW YORK, N. Y.

## FOR CANADA

H. H. ROBERTSON CO., LIMITED

Sarnia, Toronto, Montreal, Vancouver, Winnipeg, St. John, N. B., Halifax, N. S., St. John's, N. F.

## PRODUCTS

**Robertson Process Metal: Flat, Corrugated, and Mansard Sheets for Roofing, Siding, Flashings, Ridge Caps, Louvers, Gutters, Downspouts, Robertson Process Ventilators, Robertson Process Skylights, and Robertson Process Mineral Rubber.**



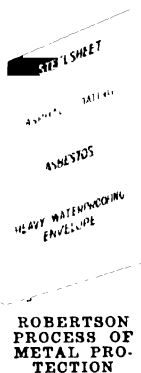
bestos protects the asphalt from mechanical abrasion. It also prevents evaporation and carbonization of this natural life-preserving product. Because of its fibrous rock character, asbestos is indestructible. It cannot rot or decay. Acids and alkalis cannot affect it.

## ROBERTSON PROCESS METAL

A metal building material which is fully protected from the most severe weather conditions, smoke, gases, fumes, acids, alkalis, condensation and salt sea air, by means of three impervious coatings—

(1) Asphalt, (2) Asbestos, (3) Waterproofing. It is made for use in the chemical industry as roofing, siding, downspouts, gutters, general building trim, skylights and ventilators. This metal is low in first cost when compared with other permanent materials, and involves no maintenance or depreciation charges. It is both rust-proof and corrosion-proof.

**Robertson Process**—The body or core is special annealed steel. It is thoroughly cleansed and immersed in a bath of special asphaltic compound. The asphalt is in turn protected by a tough, opaque and insulating covering of asphalt-saturated asbestos felt which completely covers every surface of the metal and is applied while the asphalt is hot. **The steel is hermetically sealed.** Both surfaces and edges are fully protected. The asphalt coat provides permanent protection to the metal against the corrosive influences of moisture and fumes. The as-



Finally the asbestos itself is protected by a new and original process of waterproofing, which imparts a tough, smooth, repellent surface. This waterproofing treatment also provides power of resistance to mechanical abrasion, permitting the sheets to be handled freely in shipment and erected without regard to weather temperatures.

**Forms and Colors**—Robertson Process Metal is made in corrugated, and mansard roofing and siding sheets, as well as in flat sheets and is furnished in black or maroon.

All necessary materials needed in fastening, such as nails, rivets, straps, bolts, etc., can be supplied.

**Advantages to Chemical Industry**—Robertson Process Metal is light and strong. It weighs little more per square foot than corrugated iron and at all times retains the strength of the original metal, since it suffers no loss of efficiency by corrosion or other forms of deterioration. **It is corrosion-proof and rust-proof.** It has stood severe tests on all kinds of industrial buildings and is used and indorsed by industrial engineers throughout the country. The fact that it is immune to the corroding action of gases, acid and alkali fumes, all weather conditions and salt sea air, makes it exceptionally well suited to permanent building construction.

The insulating qualities of this metal greatly reduce

*Continued on Next Page*



endency toward condensation of moisture. Buildings in which it is used are drier, and easier to heat, and remain cooler and more comfortable in summer. It is also proof against galvanic action. Its light weight, ease of erection, strength and permanency of construction as a whole less costly by comparison with other permanent building materials. Moreover, first cost is the total cost.

**For Replacement**—The fact that old roofs and siding of ordinary corrugated metal need replacement so short a time makes the need for a better material. It shows how unprofitable the unprotected metal has been. Low maintenance, painting and its upkeep costs have piled up and now in the long run it has been an expensive investment.

Robertson Process Metal will serve as a permanent replacement. Almost invariably it has outlived unprotected metal by such a wide margin that roof costs over a period of years have been cut in half. Hundreds of times it has replaced old roofs and siding and put an end to

wasteful corrosion losses and repair costs. Maintenance and upkeep costs have thus been reduced to a minimum. It can be so quickly and easily erected that replacement operations can be completed without interrupting production.

Money and time are saved by designing buildings to use standard type Robertson Process Metal corrugated sheets. They are 28" wide, have corrugations  $2\frac{5}{8}$ " wide and are carried in stock in lengths of even feet from 5' to 12'. Their net covering width is 24" with one and one half corrugations side lap.

**Purlin and Girt Spacings**—For Corrugated Sheets on roof structures having a rise of 4" or more in 12", purlins may be spaced as follows:

- No. 26 gauge for spans up to 3'9" centers
- No. 24 gauge for spans up to 4'9" centers
- No. 22 gauge for spans up to 5'9" centers
- No. 20 gauge for spans up to 6'6" centers
- No. 18 gauge for spans up to 7'6" centers

Corrugated Robertson Process Metal Sheets for Siding, girts may be spaced as follows:

- No. 26 gauge for spans up to 3'10" centers
- No. 24 gauge for spans up to 4'10" centers
- No. 22 gauge for spans up to 5'10" centers
- No. 20 gauge for spans up to 6' 8" centers

**Evidence in the Chemical Industry**—Many of the country's largest chemical manufacturers have found

WEIGHT OF ROBERTSON PROCESS METAL IN POUNDS PER 100 SQUARE FEET OF MATERIAL AREA

Gauge	Corrugated or Mansard					Flat				
	Net Weight		For Crated Shipments Add			Net Weight		For Crated Shipments Add		
	Black	Maroon	Domestic	Export		Black	Maroon	Domestic	Export	
26	138	144	14	20		128	134	10	16	
24	165	171	15	21		154	160	11	17	
22	192	198	16	22		179	185	12	18	
20	218	224	17	24		204	210	13	21	

WEIGHT IN POUNDS PER LINEAL FOOT OF ROBERTSON PROCESS METAL FLASHING

Gauge	Girth in Inches							Gauge	Girth in Inches						
	6"	7 1/2"	10"	12"	15"	21"	30"		6"	7 1/2"	10"	12"	15"	21"	30"
26	7	8 1/2	11 1/2	14	17 1/2	28	35	22	10	12 1/2	16 1/2	20	25 1/2	40	50
24	8	1	13 1/2	16	20 1/2	32	40	20	12	15 1/2	20 1/2	24	30 1/2	48	60

Note: All weights subject to variations

LENGTH OF PURLINS OR DISTANCE BETWEEN TRUSSES

Spacing of Purlins	12'		11'		16'		18'		20'		22'	
	C	I	C	I	C	I	C	I	C	I	C	I
1' 0"	4"-5 1/4" lb	4"-7 1/2" lb	5"-6 1/4" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb
1' 1"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	7"-15" lb
1' 2"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 4"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 6"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 8"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 0"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 2"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 4"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 6"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 8"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 10"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb

Maximum unit bending stress, 16,000 pounds per square inch.

Dead load equals weight of Robertson Process Metal corrugated roofing and purlins, from 3 1/2 to 6 pounds per square foot.

Live load equals 40 pounds per square foot on horizontal surface.

Pitch of roof, 6 inches per foot.

If purlins are trussed, lighter sections may be used.

Continued on Next Page

that Robertson Process Metal is the only material of its kind that will withstand the severe conditions which result from the various processes of chemical production. Evidence of this will be found in the number of manufacturers who have used it repeatedly for their building operations during the last twelve years. Robertson Products are serving these manufacturers by greatly reducing maintenance and up-keep costs and prolonging the life of their buildings. The following list is significant because all of them have repeatedly used Robertson Process Metal.

	First Order	
Butterworth Judson Corporation . . . . .	1915	22 orders
Davison Chemical Company . . . . .	1908	73 orders
E. I. du Pont de Nemours and Company . . . . .	1909	50 orders
General Chemical Company . . . . .	1909	119 orders
General Carbonic Company . . . . .	1919	4 orders
The Koppers Company . . . . .	1918	86 orders
Roesler & Haaslach Chemical Company . . . . .	1909	11 orders
F. S. Royster Guano Company . . . . .	1910	35 orders
The Semet Solvay Company . . . . .	1910	61 orders
The Sherwin Williams Company . . . . .	1916	5 orders
The Standard Guano Company . . . . .	1916	16 orders
The Standard Oil Co. and Subsidiaries . . . . .	1912	100 orders

### ROBERTSON PROCESS VENTILATOR

This Robertson product is built completely of Robertson Process Metal and will withstand the most severe gases, fumes, smoke, etc., from the inside and all weather conditions from the outside. All up-keep expense is eliminated. It cannot get out of order.



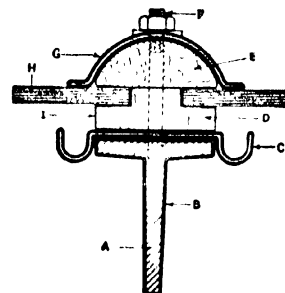
ROBERTSON PROCESS METAL VENTILATOR

It is of the stationary type, designed to provide the greatest development of air current under all conditions. It does not rely upon mechanical adjustment or moving parts which are not permanently operative and therefore cannot continue to function efficiently. It gives an exceptionally large, definite and reliable exhaust capacity under the most adverse conditions.

It is made in a variety of sizes with special features to meet all requirements.

### ROBERTSON PROCESS SKYLIGHT AND SASH

Robertson skylight and sash is a patent type of construction, the long life of which is due to the use of Robertson Process Metal and Robertson Process Asphalt. It is a form of construction that cannot corrode or rust and does not require painting.



CROSS SECTION OF ROBERTSON PROCESS METAL SKYLIGHT CONSTRUCTION

The danger from broken glass through corrosion and deflection of supporting bars and the expense of such breakage is entirely eliminated.

Bars, condensation gutters, and caps are made of Robertson Process Metal. Skylights constructed of metal, so protected, will have many years added to their life and much up-keep expense will be eliminated. Robertson Process asphalt is used for the skylight cushions and fillers. This special asphalt provides a resilient, non-absorbent, permanent, and insulating bed for the glass. It positively keeps the glass from contact with hard substances and prevents destructive strains.

### ROBERTSON POLICY

In order to insure the proper use of Robertson Process building materials, this company has at times found it necessary to undertake the erection of its material where competent workmen were not available.

A corps of engineers and chemists is maintained, which is at all times prepared to assist manufacturers, contractors, architects, and plant officials. With offices in all important cities in the United States, as well as in Canada and other foreign countries, prompt and adequate service is available.

Catalogs covering in detail the various Robertson products will gladly be sent on request.

endency toward condensation of moisture. Buildings in which it is used are drier, and easier to heat, and remain cooler and more comfortable in summer. It is also proof against galvanic action. Its light weight, ease of erection, strength and permanency of construction as a whole less costly by comparison with other permanent building materials. Moreover, first cost is the total cost.

**For Replacement**—The fact that old roofs and siding of ordinary corrugated metal need replacement so short a time makes the need for a better material. It shows how unprofitable the unprotected metal has been. Low maintenance, painting and its upkeep costs have piled up and now in the long run it has been an expensive investment.

Robertson Process Metal will serve as a permanent replacement. Almost invariably it has outlived unprotected metal by such a wide margin that roof costs over a period of years have been cut in half. Hundreds of times it has replaced old roofs and siding and put an end to

wasteful corrosion losses and repair costs. Maintenance and upkeep costs have thus been reduced to a minimum. It can be so quickly and easily erected that replacement operations can be completed without interrupting production.

Money and time are saved by designing buildings to use standard type Robertson Process Metal corrugated sheets. They are 28" wide, have corrugations  $2\frac{5}{8}$ " wide and are carried in stock in lengths of even feet from 5' to 12'. Their net covering width is 24" with one and one half corrugations side lap.

**Purlin and Girt Spacings**—For Corrugated Sheets on roof structures having a rise of 4" or more in 12", purlins may be spaced as follows:

- No. 26 gauge for spans up to 3'9" centers
- No. 24 gauge for spans up to 4'9" centers
- No. 22 gauge for spans up to 5'9" centers
- No. 20 gauge for spans up to 6'6" centers
- No. 18 gauge for spans up to 7'6" centers

Corrugated Robertson Process Metal Sheets for Siding, girts may be spaced as follows:

- No. 26 gauge for spans up to 3'10" centers
- No. 24 gauge for spans up to 4'10" centers
- No. 22 gauge for spans up to 5'10" centers
- No. 20 gauge for spans up to 6' 8" centers

**Evidence in the Chemical Industry**—Many of the country's largest chemical manufacturers have found

WEIGHT OF ROBERTSON PROCESS METAL IN POUNDS PER 100 SQUARE FEET OF MATERIAL AREA

Gauge	Corrugated or Mansard					Flat				
	Net Weight		For Crated Shipments Add			Net Weight		For Crated Shipments Add		
	Black	Maroon	Domestic	Export		Black	Maroon	Domestic	Export	
26	138	144	14	20		128	134	10	16	
24	165	171	15	21		154	160	11	17	
22	192	198	16	22		179	185	12	18	
20	218	224	17	24		204	210	13	21	

WEIGHT IN POUNDS PER LINEAL FOOT OF ROBERTSON PROCESS METAL FLASHING

Gauge	Girth in Inches							Gauge	Girth in Inches						
	6"	7 1/2"	10"	12"	15"	21"	30"		6"	7 1/2"	10"	12"	15"	21"	30"
26	7	8 1/2	11 1/2	14	17 1/2	28	35	22	10	12 1/2	16 1/2	20	25 1/2	40	50
24	8	1	13 1/2	16	20 1/2	32	40	20	12	15 1/2	20 1/2	24	30 1/2	48	60

Note: All weights subject to variations

LENGTH OF PURLINS OR DISTANCE BETWEEN TRUSSES

Spacing of Purlins	12'		11'		16'		18'		20'		22'	
	C	I	C	I	C	I	C	I	C	I	C	I
1' 0"	4"-5 1/4" lb	4"-7 1/2" lb	5"-6 1/4" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb
1' 1"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	7"-15" lb
1' 2"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 4"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 6"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 8"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 0"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 2"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb	12"-20 1/2" lb	8"-17 1/2" lb
2' 4"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb	12"-20 1/2" lb	8"-17 1/2" lb

Maximum unit bending stress, 16,000 pounds per square inch.

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Pitch of roof, 6 inches per foot.

If purlins are trussed, lighter sections may be used.

Continued on Next Page

# CHARLES A. ROOS, INC.

FOUNDED IN 1860 AS AUGUST ROOS' SON

Manufacturers of Chemical Equipment of Copper  
429-431-433 EAST 91ST STREET, NEW YORK, N. Y.

Tele. 1  
Lenox 1

## PRODUCTS

**Chemical Coppersmithing, including construction of:**

<b>Condensers and Coils</b>	<b>Percolators</b>
<b>Crystallizing Pans</b>	<b>Pipe and Fittings</b>
<b>Distilling Machinery</b>	<b>Stirrers</b>
<b>Extractors</b>	<b>Subliming Pans</b>
<b>Heat Exchanging and Cooling Apparatus</b>	<b>Tanks of all kinds</b>
<b>Kettles of all kinds</b>	<b>Vacuum Pans</b>
	<b>Varnish Kettles</b>

Still, Condensers and all other equipment for preparing and purifying Essential Oils.

We are also prepared to do work partly or entirely tin or silver-lined; also work in sheet Aluminum, Brass, Monel metal, etc.

## SERVICE

We will always be pleased to figure on your requirements in our line. Wherever possible submit blueprints or sketches and make explanations as detailed as possible. When desired we will submit suggestions for equipment and in every way possible cooperate with your own engineers or chemists in carrying out their ideas.

## TIN AND SILVER-LINED EQUIPMENT

For a number of years we have been building various pieces of chemical equipment requiring linings of tin, silver and other metals.

In doing this work we have greatly improved on the ordinary methods in use, with the result that all of this class of equipment which we have supplied has proved unusually satisfactory in operation.

We feel confident now of our ability to deal with the most difficult problems in this kind of construction. We will be pleased to quote on kettles, stills, digesters, subliming pans, etc.

## DISTILLING EQUIPMENT

Stills for various purposes have always formed a large part of our output. We have built stills for alcohol, solvents, essential oils, various organic chemicals, acids, etc.

Some of these have been simple stills, and some have been supplied with rectifying columns, dephlegmators, etc.

We design and build Stills for operation under atmospheric pressure, increased pressure or vacuum.

Any of our stills can be supplied with special stirring and agitating equipment, special openings, etc.,

and equipped with various types of condensers and receivers.

Users of our stills have found that our more than usually strong construction pays in the long run by eliminating repairs and shutdowns.

We are prepared to undertake the construction of modern distilling equipment for any purpose.

## CONCENTRATING AND EVAPORATING EQUIPMENT

We are prepared to construct a variety of evaporators, single and multiple effect, and vacuum pans suitable for concentrating and evaporating solutions, waste liquors, etc. Also evaporating equipment for supplying distilled water to power plants and chemical works.

## VARNISH KETTLES

We are large manufacturers of Varnish Kettles. We regularly make two types, one entirely made of copper and one of aluminum with copper bottom.

## CLAUSSEN CONTINUOUS BENZINE AND GASOLINE RECOVERY STILL

Made in standard sizes; 50 to 500 gals. per hour.

Suitable for recovering gasoline and other volatile solvents used for cleaning, extracting, removing grease, etc.

## SOME OF OUR SATISFIED CUSTOMERS

The Barrett Co.  
F. Bredt & Co.  
British American Chemical Co.  
Calco Chemical Co.  
Chas. Pfizer Co.  
Chas. F. Squibb  
Fries & Fries  
General Chemical Co.  
Hercules Powder Co.  
Heyden Chemical Co.  
International Paper Co.  
Lehn & Fink  
McKesson & Robbins  
Melville-Corbett Co.  
Merck & Co.  
Mutual Chemical Co. of America  
Norvell Chemical Co.  
Organic Salt and Acid Co.  
Pharma Chemical Co.  
Toch Bros.  
United Piece Dye Works  
Warner & Co.  
West Virginia Pulp & Paper Co.  
West Virginia Waste Wood Chemical Co.  
Zinsser & Co.

endency toward condensation of moisture. Buildings in which it is used are drier, and easier to heat, and remain cooler and more comfortable in summer. It is also proof against galvanic action. Its light weight, ease of erection, strength and permanency of construction as a whole less costly by comparison with other permanent building materials. Therefore, first cost is the total cost.

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wasteful corrosion losses and repair costs. Maintenance and upkeep costs have thus been reduced to a minimum. It can be so quickly and easily erected that replacement operations can be completed without interrupting production.

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Gauge	Corrugated or Mansard					Flat				
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Gauge	Girth in Inches							Gauge	Girth in Inches						
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24	8	1	13 1/2	16	20 1/2	32	40	20	12	15 1/2	20 1/2	24	30 1/2	48	60

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1' 1"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	7"-15" lb
1' 2"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 4"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 6"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 8"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 0"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 2"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 4"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 6"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 8"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
2' 10"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb

Maximum unit bending stress, 16,000 pounds per square inch.

Dead load equals weight of Robertson Process Metal corrugated roofing and purlins, from 3 1/2 to 6 pounds per square foot.

Live load equals 40 pounds per square foot on horizontal surface.

Pitch of roof, 6 inches per foot.

If purlins are trussed, lighter sections may be used.

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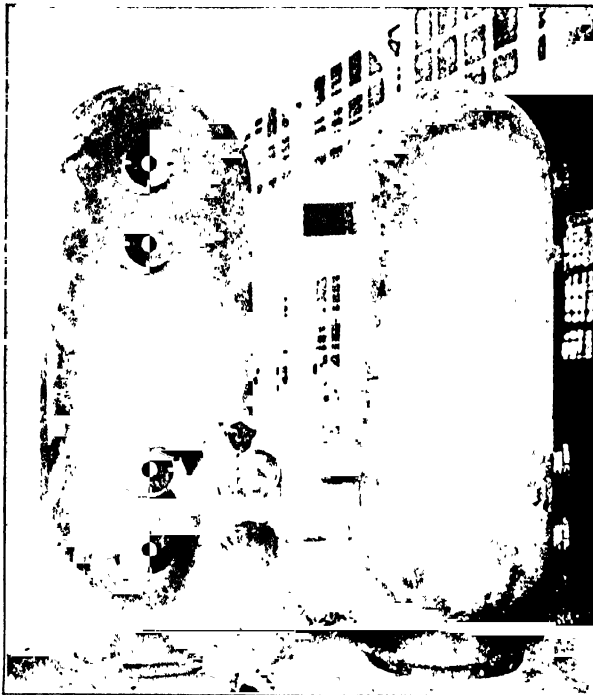
# ROSEDALE FOUNDRY & MACHINE CO.

ESTABLISHED 1871

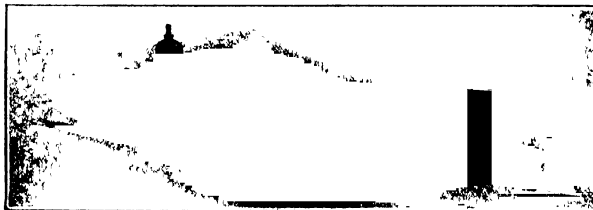
Engineers, Founders and Machinists  
PITTSBURGH, PA.

## PRODUCTS

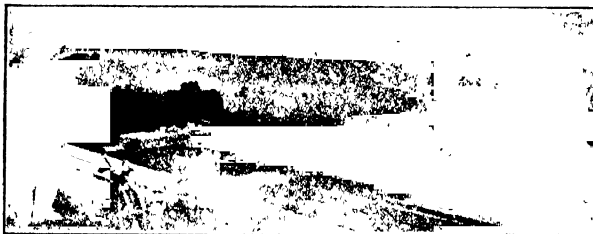
Smelting Kettles  
Acid Eggs  
Ingot and Anode Moulds  
Machinery for the manufacture of plate, ribbed,  
wire and engraved glass.  
Special heavy machinery  
Chain Grate Stokers



**ACID EGGS**  
12' Long, 4' Inside Diameter, Weight 12000 lbs., each



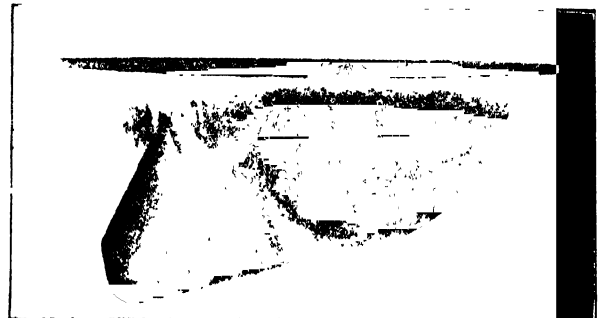
**GLASS CASTING MACHINE**  
For rolling engraved, ribbed or figured glass



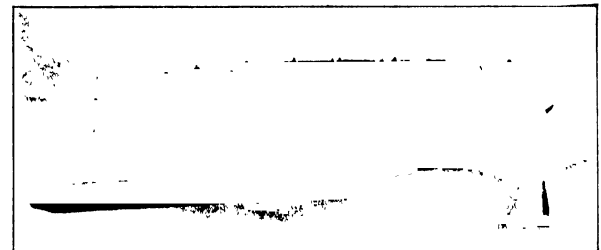
**CORRUGATED WATER COOLED GLASS ROLL**  
30" Diameter x 16' 10" Long, Weight 25000 lbs.



**SMELTING KETTLE**  
8' 10" Inside Diameter, Depth 42", Weight 12750 lbs



**SPOUT KETTLE**  
4' 6" Inside Diameter, Depth 22 1/4"



**EXHAUST ELBOW**  
For 5000 k w steam turbine. Length 20' 4", Width 14' 7", Height 5' 9",  
Weight 48000 lbs



**6600 K.W. SURFACE CONDENSER**  
Weight 72500 lbs.

... tendency toward condensation of moisture. Buildings in which it is used are drier, and easier to heat, and remain cooler and more comfortable in summer. It is also proof against galvanic action. Its light weight, ease of erection, strength and permanency of construction as a whole less costly by comparison with other permanent building materials. Therefore, first cost is the total cost.

**For Replacement**—The fact that old roofs and siding of ordinary corrugated metal need replacement so short a time makes the need for a better material. It shows how unprofitable the unprotected metal has been. Low maintenance, painting and its upkeep costs have piled up and how in the long run it has been an expensive investment.

Robertson Process Metal will serve as a permanent replacement. Almost invariably it has outlived unprotected metal by such a wide margin that roof costs over a period of years have been cut in half. Hundreds of times it has replaced old roofs and siding and put an end to

wasteful corrosion losses and repair costs. Maintenance and upkeep costs have thus been reduced to a minimum. It can be so quickly and easily erected that replacement operations can be completed without interrupting production.

Money and time are saved by designing buildings to use standard type Robertson Process Metal corrugated sheets. They are 28" wide, have corrugations  $2\frac{5}{8}$ " wide and are carried in stock in lengths of even feet from 5' to 12'. Their net covering width is 24" with one and one half corrugations side lap.

**Purlin and Girt Spacings**—For Corrugated Sheets on roof structures having a rise of 4" or more in 12", purlins may be spaced as follows:

- No. 26 gauge for spans up to 3'9" centers
- No. 24 gauge for spans up to 4'9" centers
- No. 22 gauge for spans up to 5'9" centers
- No. 20 gauge for spans up to 6'6" centers
- No. 18 gauge for spans up to 7'6" centers

Corrugated Robertson Process Metal Sheets for Siding, girts may be spaced as follows:

- No. 26 gauge for spans up to 3'10" centers
- No. 24 gauge for spans up to 4'10" centers
- No. 22 gauge for spans up to 5'10" centers
- No. 20 gauge for spans up to 6' 8" centers

**Evidence in the Chemical Industry**—Many of the country's largest chemical manufacturers have found

WEIGHT OF ROBERTSON PROCESS METAL IN POUNDS PER 100 SQUARE FEET OF MATERIAL AREA

Gauge	Corrugated or Mansard					Flat				
	Net Weight		For Crated Shipments Add			Net Weight		For Crated Shipments Add		
	Black	Maroon	Domestic	Export		Black	Maroon	Domestic	Export	
26	138	144	14	20		128	134	10	16	
24	165	171	15	21		154	160	11	17	
22	192	198	16	22		179	185	12	18	
20	218	224	17	24		204	210	13	21	

WEIGHT IN POUNDS PER LINEAL FOOT OF ROBERTSON PROCESS METAL FLASHING

Gauge	Girth in Inches							Gauge	Girth in Inches						
	6"	7 1/2"	10"	12"	15"	21"	30"		6"	7 1/2"	10"	12"	15"	21"	30"
26	7	8 1/2	11 1/2	14	17 1/2	28	35	22	10	12 1/2	16 1/2	20	25 1/2	40	50
24	8	10	13 1/2	16	20 1/2	32	40	20	12	15 1/2	20 1/2	24	30 1/2	48	60

Note: All weights subject to variations

LENGTH OF PURLINS OR DISTANCE BETWEEN TRUSSES

Spacing of Purlins	12'		11'		16'		18'		20'		22'	
	C	I	C	I	C	I	C	I	C	I	C	I
1' 0"	4"-5 1/4" lb	4"-7 1/2" lb	5"-6 1/4" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb
1' 1"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	7"-15" lb
1' 2"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 3"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb
1' 4"	5"-6 1/2" lb	4"-7 1/2" lb	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
1' 5"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb
1' 6"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	5"-9 3/4" lb	8"-11 1/4" lb	6"-12 1/4" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb	12"-20 1/2" lb	8"-17 1/2" lb
1' 7"	6"-8" lb	5"-9 3/4" lb	7"-9 3/4" lb	6"-12 1/4" lb	8"-11 1/4" lb	7"-15" lb	9"-13 1/4" lb	7"-15" lb	10"-15" lb	8"-17 1/2" lb	12"-20 1/2" lb	8"-17 1/2" lb

Maximum unit bending stress, 16,000 pounds per square inch.

Dead load equals weight of Robertson Process Metal corrugated roofing and purlins, from 3 1/2 to 6 pounds per square foot.

Live load equals 40 pounds per square foot on horizontal surface.

Pitch of roof, 6 inches per foot.

If purlins are trussed, lighter sections may be used.

Continued on Next Page

# ROVEY INSTRUMENT AND CHEMICAL CO., INC.

Exporters, Importers, Dealers Laboratory Apparatus and Chemicals

73-75 NIAGARA SQUARE, BUFFALO, N. Y.

## PRODUCTS

Apparatus, Glassware, Reagents and Stains for Industrial and Educational Laboratories.

## CHEMICAL GLASSWARE

# PYREX

A practical, efficient and economical glass for laboratories of industrial plants, schools and colleges where apparatus is frequently subjected to rough usage, and where expenses must be kept low.

## PORCELAINWARE

# COORS

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A Chemical and Scientific Porcelain equal, if not superior, to the best imported ware.

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**WHATMAN**  
High Grade FILTER PAPERS

Embodies all the experience and accomplishment of 150 years of paper making mastery.

## CHEMICALS

# "BAKER'S ANALYZED" CHEMICALS

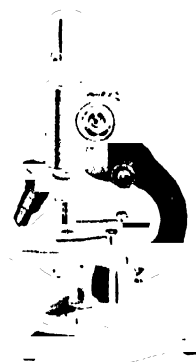
A complete line of chemical reagents, stains, normal and other solutions, oils and commercial chemicals.

## GLASS BLOWN APPARATUS

Our glass blowing factories, the best equipped in the country, are producing the highest grade glass apparatus and calibrated instruments. Special designs made according to drawings and specifications.

## BACTERIOLOGICAL APPARATUS

Autoclaves, Centrifuges, Incubators, Sterilizers, Blood Counting Chambers, Dissecting Instruments, Microscopes, Microtomes and Accessories, Petri and Staining Dishes.



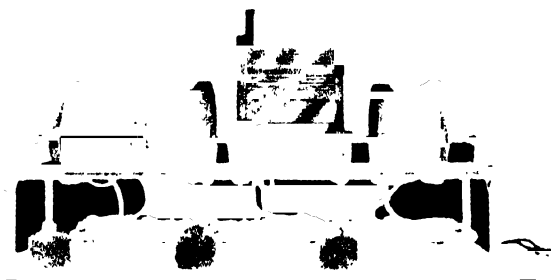
SPENCER MICROSCOPE NO. 44-H

## LITERATURE

Descriptive pamphlets, bulletins and catalogs sent upon request.

## INQUIRIES

We solicit your inquiries, drawings or specifications of materials, on which we will be pleased to submit quotations.



ORGANIC COMBUSTION FURNACE



# JOHN ROYLE & SONS

PATERSON, N. J.

## PRODUCTS

Rubber- and Celluloid-Working Machinery: Tubing and Insulating Machines; Straining Machines; Circular Looms for Hose Manufacturers.

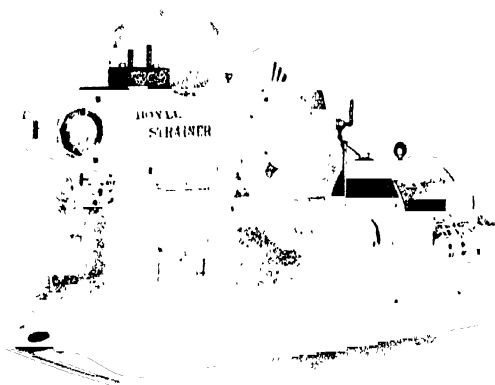
Textile Machinery (Jacquard-Card Cutting): Piano Machines, Lacers and Repeaters for hand or power operation.

Photo-Engraver's and Electrotyper's Machinery: Routers; Saw-tables; Bevelers; Planers; Mounting and Squaring Machines; Etc.

## TUBING MACHINES

Royle Tubing Machines are manufactured in six different sizes; their cylinder bores ranging from 1½ to 9" in diameter. Distinctive features include the powerful marine-type thrust bearing; four-point die and core adjustment; positive-circulation type of water jacket, and flexible system of head features which make the same machine suitable for a great variety of work.

Most sizes can be furnished complete with motor drive, soapstoning equipment, water-cooled stock screw, and variable-speed take-off mechanism, accurately mounted together upon a substantial one-piece iron base.



STRAINING MACHINE

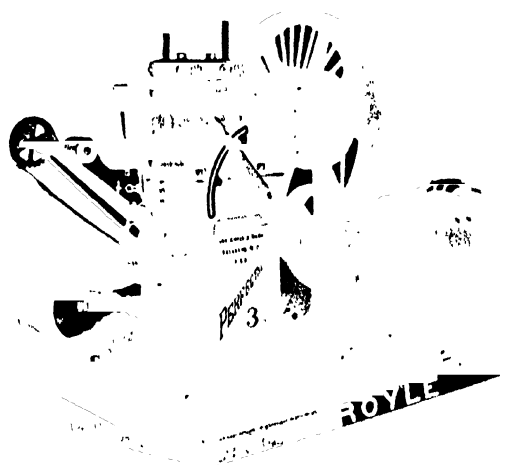
This unification of the machine with its accessories insures perfect meshing of gears and smooth economical operation. Catalog 213.

## CIRCULAR LOOMS

Royle circular looms are used for weaving the fabric jackets of fire, steam, garden, air, and other styles of hose. A perfect and uniform weave can be secured of whatever tightness is required. Ingenious and patented features assure uniform tension in both warp and filling.

The output is of continuous length, and may be woven around an interior core, the latter being fed upward through the hollow central column of the loom. Weaves either right-hand or left-hand with slight change of fixtures.

Linear capacity as high as 1000 ft. of hose jacket per day. Diameters up to 8 in. Booklet 295.

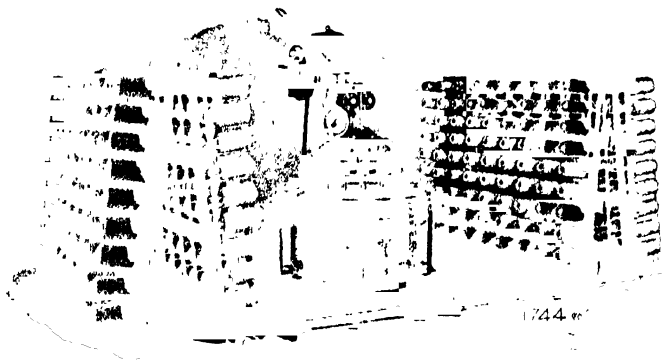


TUBING MACHINE

## STRAINING MACHINES

Where a great deal of compound must be strained quickly, we recommend the use of our special three-way delivery straining machine. Although built on the tubing machine principle, the stock-worm and cylinder are especially designed to handle large quantities of material so that full advantage may be taken of the large straining area provided by the three-way delivery head.

Under suitable conditions this style of machine will deliver more than three times as much clean stock as a single-delivery straining machine of equal bore. No heavy parts to handle in cleaning. Booklet 281.



CIRCULAR LOOM



# RUMSEY PUMP COMPANY LIMITED

129 Johnston Street  
SENECA FALLS, N. Y.



75 WARREN ST., NEW YORK, N. Y.

49 FEDERAL ST., BOSTON, MASS.

**PRODUCTS:** A complete line of hand pumps and power pumping machinery, for industrial service.



FIG. 681  
STANDARD TYPE  
TRIPLEX PUMP  
BUILT IN CAPAC-  
TIES UP TO 90 G. P. M.

## RUMSEY TRIPLEX PUMPS

A line of simple, compact power pumps, offered in a wide range of styles and sizes for any pumping application: For water supply and fire protection, boiler feeding, circulating, exerting pressures, pumping special liquors, chemicals, etc.

These machines are planned in every detail of design and construction for durable, practical service and their unusual merit is proven daily in thousands of mills and industrial plants throughout the country.

Construction details necessarily vary greatly according to the service for which pumps are rated and special conditions under which they are to operate. Detailed specifications of any pump will be mailed on request.

All pumps are regularly fitted for handling cold water but are equipped for hot water service without extra

charge. Brass or bronze mountings, special valves and packing or other alterations from standard construction necessary to meet the requirements of the Chemical field are made at a slight margin over cost.

Any pump can be furnished with special equipment, by-passes or the like, or arranged on bed plate or foundation for gear, belt, chain or direct connection to driving power.



FIG. 696  
ELECTRIC MOTOR  
DRIVEN TRIPLEX PUMP  
FOR HYDRAULIC PRESSURE



FIG. 692  
STANDARD TYPE  
TRIPLEX PUMP  
FOR LIGHT SERVICE



FIG. 698  
STANDARD TYPE  
TRIPLEX PUMP  
FOR HEAVY DUTY

## STANDARD SIZES AND CAPACITIES, MODERATE PRESSURE, SINGLE ACTING TRIPLEX PLUNGER PUMPS

Capacity per min- ute at mod- erate speed, gals.	Work- ing pres- sure, lbs.	Fig- ure No.	Plunger diameter x stroke ins.	Dis- place- ment per rev gals.	Pipes		Standard pulleys ins.	Cyl- inder
					Suc- ins.	Dis- ins.		
1.5	150	681	1 1/4 x 2	0.03	1	3/4	12x 1 1/2	Cabage
1.5	200	684	1 1/4 x 2	0.03	1	3/4	12x 1 1/2	Conchase
3.5	200	684	1 1/4 x 3	0.07	1	1	12x 2	Conchase
4.5	150	681	1 1/4 x 3	0.09	1	1	12x 2	Cab
6	130	681	2 x 3	0.12	1 1/4	1 1/4	12x 2	Cabage
8	200	684	2 x 4	0.16	1 1/4	1 1/4	12x 2 1/2	Conchase
10	150	681	2 1/2 x 4	0.20	1 1/4	1 1/4	12x 2 1/2	Cabage
13	150	681	2 1/2 x 4	0.25	1 1/4	1 1/4	12x 2 1/2	Cabage
14	200	684	2 1/2 x 4 1/2	0.28	1 1/2	1 1/2	15x 2 1/2	Concord
20	150	681	3 x 4 1/2	0.41	1 1/2	1 1/2	15x 2 1/2	Cabage
25	150	681	3 1/2 x 4 1/2	0.50	1 1/2	1 1/2	15x 2 1/2	Cabage
25	200	684	3 x 5	0.46	1 1/2	1 1/2	20x 3	Concord
30	150	681	3 1/2 x 5	0.62	2	2	20x 3	Cabage
35	200	684	3 1/2 x 5	0.75	2	2	20x 4	Concord
50	150	681	4 x 6	1.00	2 1/2	2	20x 4	Cabage
60	120	681	4 1/2 x 6	1.24	3	2 1/2	20x 4	Cabage
75	150	681	5 x 6	1.53	3	3	24x 5	Cabage
90	120	681	5 1/2 x 6	1.85	3	3	24x 5	Cabage
100	85	692	5 x 8	2.00	3 1/2	3	24x 4	Coping
100	150	691	5 x 8	2.00	3 1/2	3	30x 5	Communism
100	200	698	5 x 8	2.00	3 1/2	3	30x 6	Cotrie
125	65	692	5 1/2 x 8	2.40	3 1/2	3	24x 4	Cope
125	125	691	5 1/2 x 8	2.40	3 1/2	3	30x 5	Conet
125	165	698	5 1/2 x 8	2.40	3 1/2	3	30x 6	Cotgate
150	55	692	6 x 8	2.93	4	3 1/2	24x 4	Cocquette
150	100	691	6 x 8	2.93	4	3 1/2	30x 5	Commuter
150	140	698	6 x 8	2.93	4	3 1/2	30x 6	Cotta
175	43	692	6 1/2 x 8	3.44	4	4	24x 4	Cocoma
175	85	691	6 1/2 x 8	3.44	4	4	30x 5	Cotnose
175	120	698	6 1/2 x 8	3.44	4	4	30x 6	Coton
215	85	692	6 1/2 x 10	4.30	5	4	30x 6	Cordovan
215	150	691	6 1/2 x 10	4.30	5	4	36x 6	Compart
215	200	698	6 1/2 x 10	4.30	5	4	42x 6	Cotswold
250	195	690	7 x 10	5.00	5	5	42x 6	Comprint
270	75	692	7 1/2 x 10	5.35	6	5	30x 6	Cormorant
270	125	691	7 1/2 x 10	5.35	6	5	36x 6	Combing
270	160	698	7 1/2 x 10	5.35	6	5	42x 6	Cotta
325	55	692	8 x 10	6.50	6	5	30x 6	Coronet
325	100	691	8 x 10	6.50	6	5	36x 6	Correlative
325	130	698	8 x 10	6.50	6	5	42x 6	Cottage
345	150	690	8 1/2 x 10	6.94	6	5	42x 6	Compart
415	125	690	9 x 10	8.26	7	6	44x 6	Compass
415	150	690	9 x 10	8.26	7	6	42x 10*	Comper
445	185	690	9 x 12	9.91	8	8	48x 10*	Comple
510	100	690	10 x 10	10.20	8	8	44x 6	Comper
510	150	690	10 x 10	10.20	8	8	42x 10*	Compos
550	150	690	10 x 12	12.24	8	8	48x 10*	Compress
590	85	690	10 1/2 x 10	11.25	8	8	44x 6	Comptol
590	135	690	10 1/2 x 10	11.25	8	8	42x 10*	Comptote
570	215	788	10 x 14	14.28	8	8	60x 14†	Corrigent
605	135	690	10 1/2 x 12	13.50	8	8	48x 10*	Compret
690	90	789	11 x 14	17.28	12	10	60x 10*	Corposce
690	175	788	11 x 14	17.28	12	10	60x 14†	Corridon
820	75	789	12 x 14	20.56	12	10	60x 10*	Corposant
820	150	788	12 x 14	20.56	12	10	60x 14†	Corra
965	65	789	13 x 14	24.12	12	10	60x 10*	Corplent
965	130	788	13 x 14	24.12	12	10	60x 14†	Correlate
1,120	55	789	14 x 14	27.98	12	10	60x 10*	Corpsule
1,120	110	788	14 x 14	27.98	12	10	60x 14†	Corridor

\*Single pulley. †Single pulley for double belt. Other sizes have tight and loose pulleys

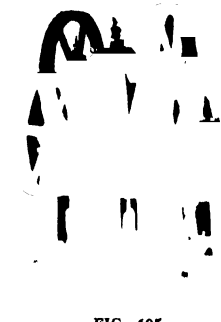


FIG. 695  
TYPICAL DESIGN OF HY-  
DRAULIC PRESSURE PUMP  
SHOWING A PUMP  
FOR 8000 LBS. PRESSURE



FIG. 694  
BALL VALVE TYPE  
TRIPLEX PUMP  
FOR VISCOUS  
LIQUIDS

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# RUMSEY ROTARY PUMPS

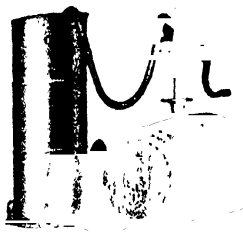


FIG. 196 1/2  
ROTARY TRANSFER PUMP

Fig. 196 1/2 Hand Rotary Pump is designed for emptying barrels or transferring liquids from one container to another. Hand pumps are also made with bases for floor or shelf mounting. Connections may be for either pipes or hose.

Fig. 197 1/2 Power Rotary Pump is used for water supply and for pumping oils and chemicals.

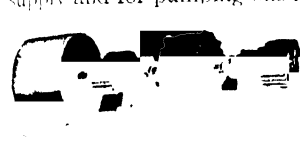


FIG. 198  
POWER ROTARY PUMP

Rotaries are used with economy by thousands of manufacturers for water supply or for handling a great variety of liquids such as oils, varnishes, acids and chemicals, molasses, glue, extracts, ink, chocolate, milk and the like. As the action of these pumps is metal to metal they cannot be used for gritty liquids.



FIG. 197 1/2  
POWER ROTARY PUMP

The heavier type of Power Rotary Pump, Fig. 198, is extensively used in mills, warehouses and factories for general water supply, pumping to sprinkler systems, handling special liquids and for fire protection.

No.	Capacity per min. 100 Rev.*	Pipe		Pulleys Diam. x Face	List		
		Suc. in.	Dis. in.		Iron	Brass Case and Cams	Brass
FIG. 196 <sup>1</sup> / <sub>2</sub>							
1	13 gals.		1 <sup>1</sup> / <sub>2</sub>		\$19.00		\$63.00
2	25 "		1 <sup>1</sup> / <sub>2</sub>		22.00		71.00
FIG. 197 <sup>1</sup> / <sub>2</sub>							
1	13 gals.	1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>	7 x 2 <sup>1</sup> / <sub>2</sub>	\$26.50	\$75.00	\$90.00
2	15 "	1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>	7 x 2 <sup>1</sup> / <sub>2</sub>	30.00	83.00	98.00
3	29 "	2	2	12 x 3 <sup>1</sup> / <sub>4</sub>	47.50	125.00	159.00
4	43 "	2 <sup>1</sup> / <sub>2</sub>	2	15 x 3 <sup>1</sup> / <sub>4</sub>	53.00	142.00	189.00
FIG. 198							
1	29 gals.	2	2	14 x 1 <sup>1</sup> / <sub>2</sub>	\$175.00	\$267.00	\$315.00
2	43 "	2 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>2</sub>	16 x 5 <sup>1</sup> / <sub>2</sub>	200.00	340.00	385.00
3	87 "	3	3	18 x 6 <sup>1</sup> / <sub>2</sub>	280.00	500.00	585.00
4	168 "	4	5	20 x 8 <sup>1</sup> / <sub>2</sub>	415.00	875.00	1055.00
5	270 "	6	6	24 x 8	530.00	1175.00	1450.00
6	456 "	8	8	28 x 9	835.00	1840.00	2300.00

\*For light or intermittent service, speed may be increased; for heavy, constant duty, speed should be diminished.  
†For hose.

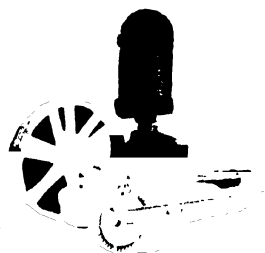
The moderate price of the rotary pump as compared with its large capacity has made it a very popular type for such service.

BULLETIN DC-18 on application

## DOUBLE ACTING POWER PUMPS

Reliable pumps for tank pumping and general use where an inexpensive outfit is desired. Made with brass lined cylinder, leather packed piston, metal valves, large air chamber and back gearing.

These pumps are offered in capacities of from 4 to 65 gals. per minute. Illustration shows a 2 x 3-in. pump, larger sizes differ in design.



DOUBLE ACTING PUMP

# RUMSEY CENTRIFUGAL PUMPS

A range of inexpensive centrifugal pumps to meet the requirements of industrial plants for water supply, drainage, circulating, handling thick liquids, pulps and chemicals and for many special applications, where the total head does not exceed fifty feet.

These pumps are interchangeable throughout and peculiarly adapted to acid service on account of the ease and low cost of renewals.

These pumps are built in both horizontal and vertical patterns either for belt or direct motor drive and with many possible variations in detail.

Special centrifugal pumps for handling concentrate sulphuric acid or liquors of like action are also made, as are a number of more expensive pumps for heavier duty.

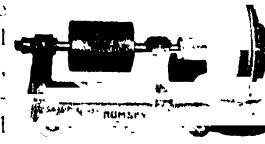


FIG. 201  
HORIZONTAL PATTERN  
BELT DRIVEN



FIG. 202  
VERTICAL PATTERN SUBMERGED TYPE, BELT DRIVE



FIG. 205  
HORIZONTAL PATTERN  
MOTOR DRIVEN

Pipe Sizes			Normal Capacity per Min. gallons.	Pulley Diam. x Face Inches	List	
No.	Suc.	Dis.			Iron	Brass
FIG. 201 HORIZONTAL TYPE						
00	1	1	10	3 x 3	\$ 28.00	\$ 52.00
2	2	2	75	6 x 6	35.00	98.00
3	2 1/2	2 1/2	150	7 x 8	65.00	196.00
4	3	3	225	7 x 8	75.00	236.00
5	4	4	325	8 x 10	90.00	261.00
6	5	5	625	10 x 10	120.00	408.00
6 1/2	6	5	925	10 x 10	110.00	540.00
7	7	6	1300	12 x 12	180.00	652.00
8	10	8	2100	18 x 12	310.00	
FIG. 202 VERTICAL SUBMERGED TYPE						
2		2	75	6 x 6	\$ 28.00	\$ 85.00
3		2 1/2	150	7 x 8	55.00	164.00
4		3	225	7 x 8	65.00	213.00
5		4	325	8 x 10	70.00	261.00
6		5	625	10 x 10	105.00	326.00
6 1/2		5	925	10 x 10	140.00	497.00
7		6	1300	12 x 12	150.00	571.00
8		8	2100	18 x 12	265.00	

# RUMSEY DIAPHRAGM PUMPS

Large capacity hand pumps for drainage or handling thick liquors or liquids containing foreign matter that would clog an ordinary pump. Made in three sizes for 2 1/2, 3 or 4 inch suction hose or pipe and with either side suction as illustrated or bottom suction for vertical pipe connection.



FIG. 535  
SIDE SUCTION

## BULLETINS

General Catalog 57th Edition, Hand and Power Pumps; Catalog DC, Rotary Pumps; Catalog DF, Centrifugal Pumps; Catalog B, Triplex Power Pumps; Catalog DW, Deep Well Pumps; Brochures on special hand and power pumps.

# RUGGLES-COLES ENGINEERING COMPANY

Established 1893

Designers and Builders of Ruggles-Coles Dryers

120 BROADWAY, NEW YORK, N. Y.

## PRODUCTS

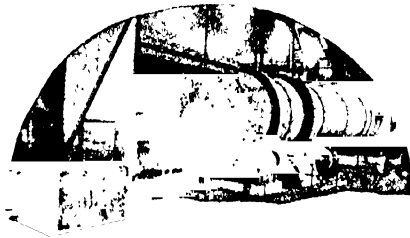
Ruggles-Coles Rotary and Paddle Dryers; double and single shell; eight standard types for drying by means of direct heat, indirect heat or steam.

### CLASS "A" DRYER

This is a patented double shell, direct heat dryer especially adapted for materials which can be dried in large quantities; viz:

Coal	Rock
Coke	Sand
Ores	Stone
Clays	Concentrates, etc.

With this type of dryer, the maximum temperature to which the material can be heated is 400° F., though



CLASS "A" DRYER

the machine may be so operated that the material will not be heated to over 220° F.

Our Class "A" Dryer is built in nine standard sizes.

### CLASS "B" DRYER

Our Class "B" Dryer is a patented double shell, indirect heat dryer, especially designed for drying

China Clays	Whiting
Talc Rock	Kaolin

and those materials which may be dried at a fairly high temperature but must not come in contact with the



CLASS "B" DRYER

products of combustion due to possible injury or contamination.

This dryer is made in three standard sizes.

### CLASS "C" DRYER

A rotary steam dryer for materials which must be dried at a low temperature to prevent injury to the material, viz:

Brewer's Grains	Starch Feed
Cotton Seed	Tobacco Stems
Corn Germs, etc.	



CLASS "C" DRYER

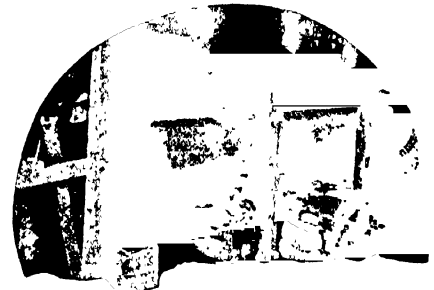
Either live steam or exhaust steam may be used to greatest advantage with our Class "C" Dryer, which is made in four standard sizes.

### CLASS "D" AND "E" DRYERS

These are paddle dryers, built in special sizes for direct heat, indirect heat or steam—depending upon the material to be dried.

### CLASS "F" DRYER

This is a single shell, direct heat dryer of heavy and substantial design for use on those materials and in



CLASS "F" DRYER

those places where first costs are the main consideration.

Our Class "F" Dryer is built in seven standard sizes.

## GENERAL

For over a period of 28 years, the Ruggles-Coles Engineering Company have specialized in drying problems and drying equipment. Our dryers possess a high reputation for rugged construction; continuity of operation; low maintenance and operating costs; greatest capacity and thorough drying.

We suggest that inquiries regarding any of our eight types of dryers be accompanied by specific information concerning the material to be dried and conditions of operation. Full details will be gladly submitted.

# SARCO COMPANY, INC.

Manufacturers of Steam Traps and Temperature Regulators

19 BARCLAY STREET, NEW YORK, N. Y.

Philadelphia, Pa., Drexel Bldg  
New York, N. Y., Ellcott Square

Cleveland, O., 6523 Euclid Ave  
Detroit, Mich., Majestic Bldg

Chicago, Ill., Menadnock Bldg  
Montreal, Can., Pencock Bros

## PRODUCTS

Steam Trap Sarco; Sarco Radiator Trap; Sarco Temperature Regulators for Liquids and Atmosphere.

### STEAM TRAP SARCO

This is a small, compact, simple steam trap that does the same work as the more cumbersome bucket or float traps and costs only one-third the price.

The Steam Trap Sarco has only one moving part. No levers, gauges, stuffing boxes, etc., to get out of order and need attention.

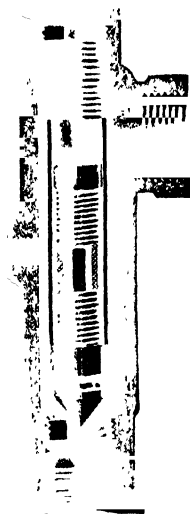
The Sarco operates automatically and dependably by the opening and closing of a valve controlled by a sensitive but absolutely reliable expansion element.

It releases condensate as rapidly as it collects, and does not waste live steam. Condensate is returned to the hot well while still hot, instead of lying around until it is cold as in bucket traps.

Can be installed any point on line, at any angle. No floor space, pit digging, building up or supports required.

Made in sizes  $\frac{3}{8}$  to 3 inches for any given pressure up to 200 lbs.

Sold on 30 days' free trial. Booklet K-12 on request.



DETAIL OF STEAM TRAP SARCO

#### LOW PRESSURE—0 TO 50 LBS.

Size	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"	1 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "	2"	2 $\frac{1}{2}$ "	3"
Price	\$6.00	\$6.00	\$9.45	\$11.25	\$21.15	\$30.00	\$38.70	\$51.75	\$60.00

#### HIGH PRESSURE—50 to 200 LBS.

Size	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"	1 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "	2"	2 $\frac{1}{2}$ "	3"
Price	\$7.75	\$7.75	\$10.85	\$12.00	\$28.50	\$34.50	\$48.80	\$60.00	\$75.00

## SARCO TEMPERATURE REGULATOR

Is made for room temperature control, for dry kiln work and for tank control, and is supplied for any given temperature between 30° and 300° F.

It derives actuating motive power from the expansion and contraction of a sensitive liquid hermetically sealed within the apparatus. In its simplest terms the regulator consists of a tube of oil, which, on expanding, operates a packless valve. Thus the regulator is entirely self-operated. It requires neither water, electricity, nor compressed air.

The first cost is moderate, installation expense trifling, and operation expense entirely eliminated. Has no complicated attachments to get out of order: no leather or rubber diaphragms or other perishable parts.

The Sarco Temperature Regulator is suitable for laboratory control as well as for all manufacturing processes within its range of temperature.

The Sarco Temperature Regulator operates steam, water and gas valves, and has 6 feet connecting tubing between elements, which length can be increased where conditions necessitate.

Sold on 30 days' free trial. Ask for Booklet K-52. TYPE KR-14 SARCO TEMPERATURE REGULATOR FOR ATMOSPHERE UP TO 300° F.

Size of valve	$\frac{1}{4}$ "	$\frac{1}{2}$ "	1"	1 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "	2"	2 $\frac{1}{2}$ "	3"	4"	5"	6"
List prices	\$60	\$65	\$70	\$75	\$85	\$95	\$110	\$130	\$170	\$225	\$265

#### TYPE TR-21 SARCO TEMPERATURE REGULATOR FOR LIQUIDS AND DRY KILNS

Size inches	Weight pounds	List prices	Size inches	Weight pounds	List prices	Size inches	Weight pounds	List prices
$\frac{1}{4}$	8	\$75	1 $\frac{1}{4}$	22	\$95	3	51	\$135
$\frac{1}{2}$	8	80	2	28	100	4	81	185
1	9	85	2 $\frac{1}{2}$	37	115	5	132	250
1 $\frac{1}{2}$	13	90				6	158	300



# THE SCHAEFFER & BUDENBERG MFG. CO.



Instruments for  
Measuring Pressure, Temperature, Power and Speed  
BROOKLYN, N. Y.

Philadelphia  
Pittsburgh

Chicago  
Los Angeles

Washington  
San Francisco

Detroit  
Atlanta



## PRODUCTS AND SERVICES

**Gauges:** Pressure, Vacuum and Draft;  
**Recording Gauges:** "Columbia" and "Schaeffer";  
**Indicating Thermometers:** "Crescent" and "Reform";  
**Recording Thermometers:** "Columbia" and "Schaeffer";  
**Tachometers:** Hand and Stationary;  
**Counters:** Indicating and Recording;  
**Calorimeters:** "Carpenter's" Separating and Throttling Steam.

Also Gauge Testers, Gauge Glasses, Locomotive Clocks, Barometers, Calorimeters, Gauge Boards and Complete Equipment.

Without obligation, our Engineering Department will make recommendations, based on over 70 years' experience, for increasing production, lowering operating cost and eliminating spoilage of goods by the use of above instruments.

## GAUGES

A complete line of S & B pressure, vacuum and draft gauges for all purposes. Have extra heavy, long-wearing, non-corrosive movement. Dial is hand calibrated, insuring accuracy. White enameled matt finish eliminates glare and makes reading easy. Write for Catalog No. A-3.



PRESSURE GAUGE

## RECORDING GAUGES

"Columbia" and "Schaeffer" Recording Gauges for accurately recording pressure, vacuum or draft.

Being non-corrosive and especially rugged in construction, the clock movement in these gauges will outwear any other make.

Time Punch makes a small hole in disc at exact time button is pressed, thus acting as a time clock.

Removable arm makes it easy to renew chart. No danger of straining arm and affecting accuracy of record. Pen is of glass and can be renewed. It cannot corrode nor leak. Day and night records are more easily read than on other makes due to wider area. Write for Catalog No. E-3.

## DRAFT GAUGES

S & B "Redline" Draft Gauges have closed front, protecting glass parts against breakage and eliminating exposed cavity where dust ordinarily collects.

Body is polished aluminum. Indicating column is thoroughly seasoned Jena glass with uniform bore. Scales are accurately calibrated. Spirit level is carefully fitted.

Made in many designs and types for measuring drafts. Write for Catalog No. C-3.



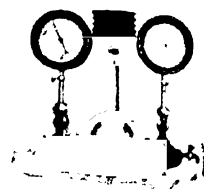
"Redline" Differential DRAFT GAUGES



"COLUMBIA" RECORDING GAUGE

## GAUGE TESTERS

Gauges must be accurate at all times and should, therefore, be periodically tested. Among the many types of S & B Gauge Testers for testing gauges of all types and capacity, there is sure to be an apparatus that is compatible with your needs. Write for catalog No. D-3.

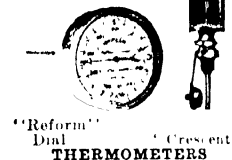


GAUGE TESTER

## THERMOMETERS

Among our line of high grade "Crescent" Thermometers will be found those used in every industry. Also other types of thermometers for diverse industrial requirements.

The "Reform" mercury-actuated dial-face thermometer is made with rigid back or bottom connection, or with flexible connection, for any temperature range up to 1000° F. Write for Catalogs F-3 and G-3.



"Reform" Dial "Crescent" THERMOMETERS

## RECORDING THERMOMETERS

"Columbia" and "Schaeffer" Recording Thermometers give authentic records of temperature up to 1000° F.

Three types, actuated by either mercury, gas or vapor tension.

Clock movement is ruggedly built, for long service. Will not corrode.

Responds instantly to slightest temperature changes and guaranteed accurate.

Time Punch makes a small hole in disc at exact time button is pressed, thus acting as a time clock.

Removable arm makes renewal of chart easy and eliminates possibility of straining arm and affecting accuracy of records.

Renewable glass non-spilling and non-corroding pen insures dependable, readable records. Day and night chart has wider area than usual, giving a more readable record.

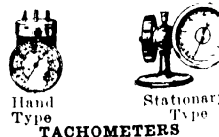
Tubing is fume, acid and water proof and practically indestructible. Write for Catalog No. H-3.



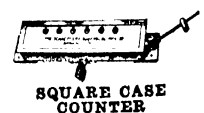
"COLUMBIA" RECORDING THERMOMETER

## TACHOMETERS

For measuring speeds of shaftings, machines, motors, turbines, etc., directly in r. p. m. S & B Tachometers are made in several types, both hand and stationary. The latter are for permanent connection, of both indicating and recording types, for all applications. Write for Catalogs Nos. J-3 and K-3.



Hand Type Stationary Type TACHOMETERS



SQUARE CASE COUNTER

# THE SCHAFFER ENGINEERING & EQUIPMENT CO.

Peoples Bank Building, PITTSBURGH, PA.

Cable Address: SEECO, PITTSBURGH

## PRODUCTS:

The Schaffer Hydrator; The Schaffer Poidometer;  
Shaking Screens; Calcining Processes; Etc.

Specialists in Automatic Operation of Heavy Duty  
Plants.

## THE SCHAFFER HYDRATOR:

Will operate *automatically*.

Will give laboratory conditions in practical operations.

Will handle dolomitic or high calcium quicklimes.

Will hydrate any materials capable of hydration.

Will consume little power per ton capacity.

Will occupy little space per ton capacity.

Will be cheaper to install per ton capacity.

Will permit of absolute control to suit any conditions.

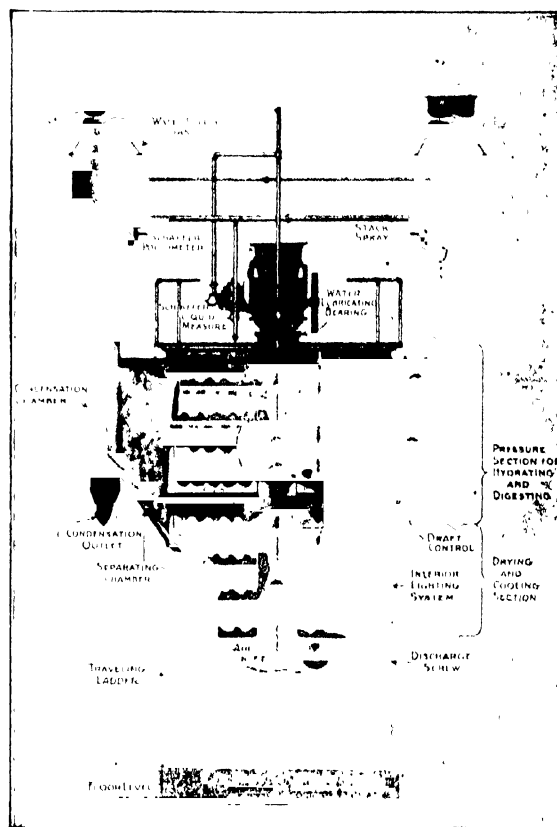
Will give a product superior to any competing machine or process.

Will operate mechanically right.

Will require minimum repairs.

Will prove indispensable after investigation.

Write for literature.

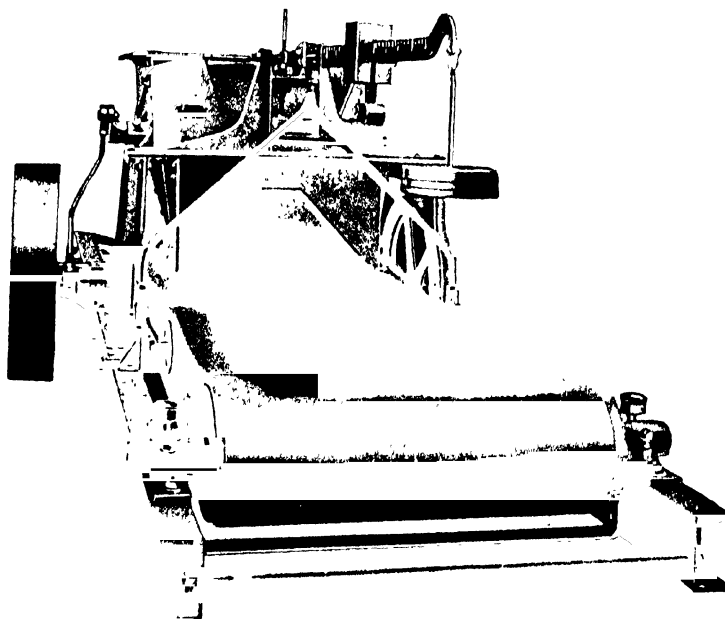


THE SCHAFFER HYDRATOR

## THE SCHAFFER POIDOMETER:

The Schaffer Poidometer is essentially a weighing machine and is positively indispensable where materials are to be correctly apportioned. It is accurate up to 99.75%. It is very economical in operation and is the only commercial scale on the market today which will perform the function of correct proportioning of materials and of adding liquids thereto with the accuracy above mentioned. Mechanical weighmaster attachment permits of batch use where desired, although it is primarily a continuous *automatic* weighing machine.

Write for our Bulletin No. 5 fully describing this machine and let us tell you what it will do in your particular instance. Every machine installed on a guarantee of absolute satisfaction.



THE SCHAFFER POIDOMETER

# SCHUTTE & KOERTING COMPANY

Manufacturing Engineers

MAIN OFFICE AND WORKS

1211 AND THOMPSON STS., PHILADELPHIA, PA.

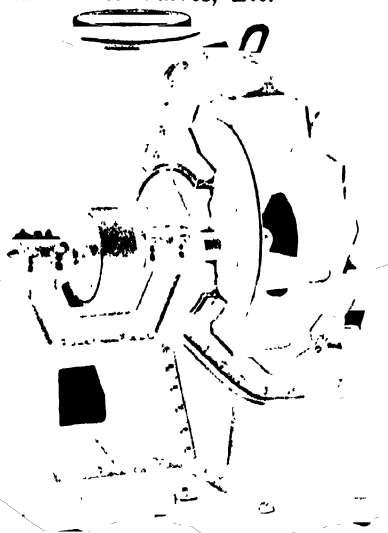
## PRODUCTS

Equipment for lifting liquids, moving air and other gases, burning oil, heating and cooling oil, also Condensers, Spray Nozzles, Liquid Heaters, Acid Valves, Injectors, Engine and Boiler Valves, Etc.

### LEAD FANS

For Chemical Works, features that remove nearly all overhang on the shaft, prevent leakage around the shaft and give positive suction and discharge.

We have fans for all capacities. Made of regulus metal and of improved design, low horse power, low speed with large capacity; built for any position discharge.



ROTARY LEAD FAN

### BIHN JONES AUTOMATIC BLOW CASES

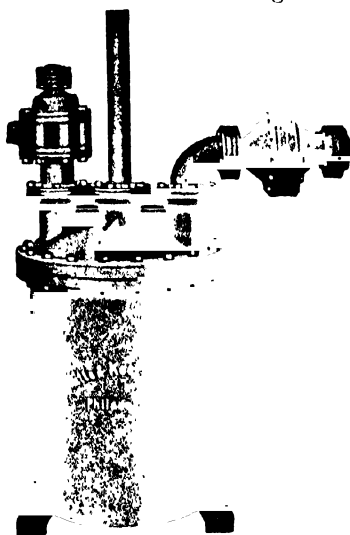
The only truly Automatic Acid Egg; operated by compressed air and so nicely controlled by the Automatic valve that it entirely eliminates air loss and expense of labor for operating.

Particularly adapted to continuous circulating conditions, high lifts and corrosive liquids.

It permits the use of a small egg and maintains a steady level in receiving tanks and in sulphuric acid chamber sets it will assist in increased production and reduce nitre consumption as well as labor and air expense.

The Essential Valves can be installed on existing blow cases.

There is only one movable part, hence it gives long and efficient service.



AUTOMATIC BLOW CASE

### HARD LEAD CENTRIFUGAL PUMPS

The Body as well as the rotor of these pumps is made of lead with a steel shaft which is protected from the acid by a lead sleeve.

These lead pumps are designed for hard, continuous service. Furnished with or for any type of drive desired, and of different chemical resistant materials.

### SULPHUR FURNACES

The features of this furnace are its closed type, heavy construction, freedom from sublimation and long and efficient service.

Especially applicable to bleaching sulphating and sulphurous acid operations.

### HEAT TRANSFER EQUIPMENT

Our Oil Coolers find a wide application in process work and industrial requirements.

### OBNOXIOUS VAPOR CONDENSERS

For the elimination of objectionable fumes and odors in Fertilizer Works, Acid Plants, Glue Works, Etc.

It produces its own suction, hence, combines the action of a fan or blower with the absorbent action of a water jet or spray. No movable parts, inexpensive in operation. In special cases other liquids than water may be used.

### OIL BURNING EQUIPMENT

We manufacture Oil Burning Equipment that is adapted to every industrial need. Our line includes Mechanical Atomizers, Steam and Air Atomizers.

We have a Burner for every class of liquid and gaseous fuel.

Our Oil Heaters and Strainers are universally used in industrial plants.

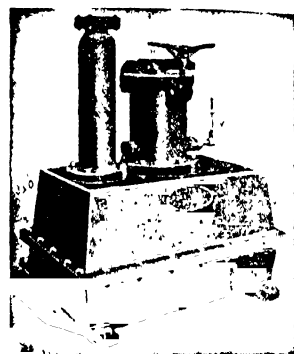
### VALVES

We manufacture a complete line of Boiler and Engine Valves, among which are types of Hard Bronze, Schutte Extra Heavy Standard, Stop, Stop Check, Check, Emergency, Balanced Throttle, Trip and Throttle, Reducing, Engine Stop Systems, and many others.

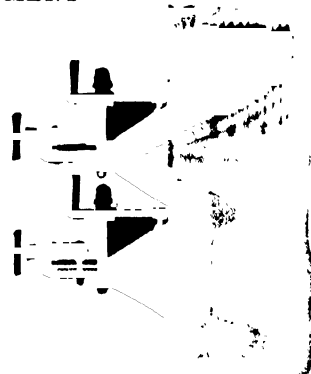
### LEAD LINED VALVES

**Globe and Angle**—All surfaces of this valve liable to be affected by acid are substantially lined with lead, and all faces are turned true so as to obtain a perfect joint which effectively prevents acid leaking through and disintegrating the metal parts.

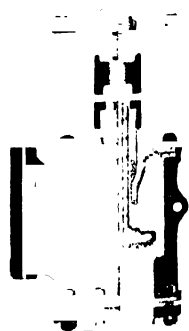
The construction of this valve is clearly shown in the illustration.



SULPHUR FURNACE



MECHANICAL FORCED DRAFT BURNER



LEAD LINED VALVE

*Continued on Next Page*

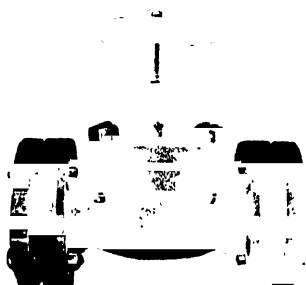


the hand-wheel and nut only revolve; the spindle does not turn—its movement is up and down only, and the spindle therefore indicates the open and closed position. The valve disc consists of a broad plate which conforms with its seat practically as a line, hence will not get dirt or stick as is so apt to occur in a conical or spherical seat type of valve.

Being lead lined with a protecting iron shell it is compact and light in weight, but strong and applicable to all conditions of operation suitable to lead valves.

### DIAPHRAGM ACID VALVES

Objectionable features have been overcome in the diaphragm valves shown herewith. They have no stuffing box and no stem extending into the acid. The disc is made of high-grade rubber composition which withstands the action of acid, and has no tendency to stick on the seat. The acid comes in contact only with lead or rubber. The valve body is hard lead throughout and is a durable valve applicable to cool and moderately strong acids.



LEAD DIAPHRAGM VALVE

### JET APPARATUS

This embraces a large number of types of equipment, in which steam, water or air is used as the motive power. The conditions of operation decide the nature of the apparatus and the motive power most suitable.

We supply equipment for transferring liquids, moving gases to give vacuum or compression, induce drafts and produce ventilation, prime pumps, assist in processes of distillation or evaporation, etc.

The list embraces Boiler Feed Injectors, Syphons, Noiseless Heaters, Exhausters, Blowers, Air Jet Lifts, Condensers, etc.

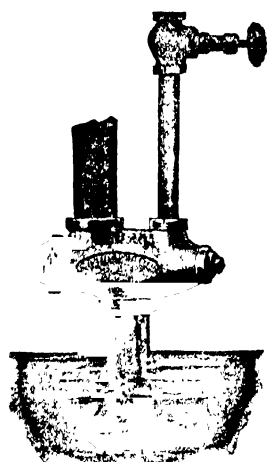
### KOERTING SYPHONS

They are especially suitable for transferring liquids from tank to tank, for circulating, agitating, and making or assisting in solution of solids.

They are made of brass, iron, lead, stoneware or hard rubber and can be supplied to operate with water instead of steam, if desired.

### AIR JET LIFTS

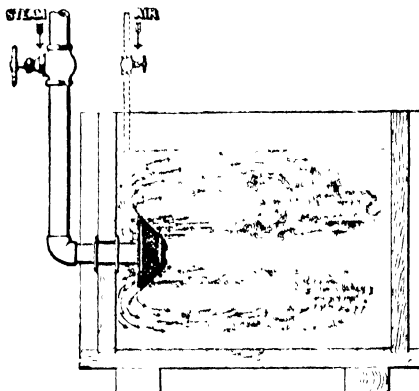
When air is desired as a motive power the Air Jet Lift is a simple and efficient apparatus for lifting liquids. Continuous operation, low pressure of air, no moving parts, and great durability in service.



"UNIVERSAL" SYPHON INSTALLATION

### NOISELESS HEATERS

In the many cases where liquids are heated by direct admission of steam, this heater finds application because it not only eliminates the heavy knocking noise, but at the same time heats more quickly by its circulating and agitating action. We have modified forms to meet different conditions.

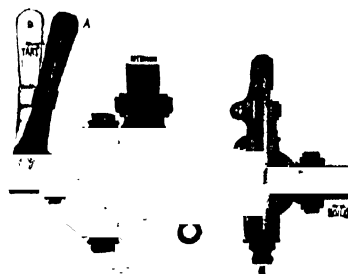


INSTALLATION OF A NOISELESS HEATER

### INJECTORS

The term "Koerting Universal Double Tube Injector" is synonymous with the highest requirements in Industrial Boiler Practice.

These Injectors handle water at temperatures up to 150 deg. F., and are absolutely reliable in operation.



"UNIVERSAL" DOUBLE TUBE INJECTOR

### EXHAUSTERS

These are made of suitable material and are applied to the production of vacuum or compression, handling of gases, agitating liquids, priming pumps, etc.

### SPRAY NOZZLES

Rubber, Brass, Stoneware, Iron, Lead, Wilelay, Steel, Glass, Special.

They are applicable to all chemical purposes such as acid manufacture, absorption of gases, washing of gases or solids, solution, removal of objectionable gases or vapor, cooling by sprays, or in fact any conditions where liquids as a spray can be utilized.

### MULTI JET CONDENSERS

Invite your attention by the following features:

Compactness and low head-room requirements.

Absence of a separate air pump, the removal of the non-condensable gases being accomplished by means of water jets.

Utmost simplicity of construction, and reliability under the most severe operating conditions, making the Multi Jet Condenser practically trouble-proof.

Economic Operations, with auxiliaries comprising but one standard Centrifugal Injection Pump, operating with highest hydraulic efficiency.



MULTI JET CONDENSER

# SCHWARTZ SECTIONAL SYSTEM

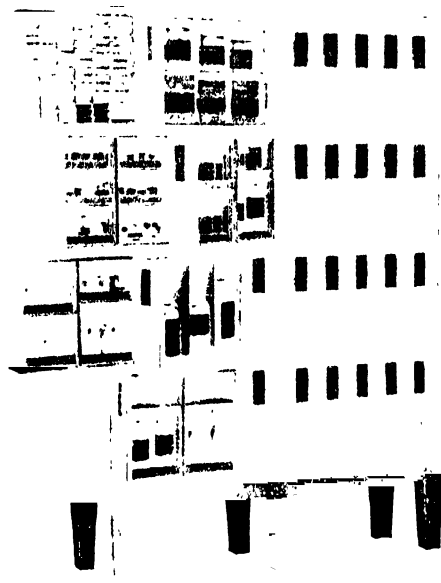
INDIANAPOLIS, U. S. A.

## PRODUCT

Schwartz Sectional System of Filing Cabinets for Chemicals, Reagents, Specimens, Samples, and Small or Large Articles in Laboratories and Chemical Store-rooms.

## UNIT SYSTEM

The system is built up of interchangeable unit sections. All units are finished to match the furniture in the laboratory or office of the purchaser. All subsequent purchases will match and interchange with those previously purchased. No carpenter is required for installation. Each Standard Unit Cabinet contains twenty drawers, and is 24 inches wide, 60 inches high, and 18 inches deep.



TWO VERTICAL SECTIONS ON SANITARY BASE  
One partly open, one closed Pat. Jan. 11, 1910

## ADVANTAGES

Saves space, breakage and disorder. Protects the contents from the deteriorating effect of light, dust and laboratory fumes. So stored that the chemical wanted can, by the use of the alphabetical index, be found instantaneously. Provision is made for articles of all sizes. The system is so simple in operation that a new chemist or laboratory helper can find any chemical in the cabinet without asking questions.

## MATERIALS AND CONSTRUCTION

Unit Standardized construction so reduces costs as to allow of the best material being used. All drawers are accurately dovetailed, and are warranted not to warp or stick. All drawer pulls, numbers, and card holders are solid brass. The woods used are the best quartered oak and birch, stained mahogany color.

## THE INDEX

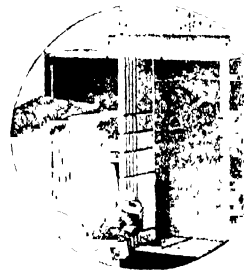
After you have loaded the cabinets to your own satisfaction all articles you have in the cabinets are indexed for you in an alphabetical loose-leaf index, which places any item instantly at the finger tips. This service is supplied whenever two or more standard units of the cabinet are ordered.

SCHWARTZ  
SECTIONAL  
SYSTEM

## THE INDEX

## BASES FOR STANDARD SECTIONS

In addition to the sanitary base shown, bases are furnished containing cupboards, or containing six drawers. The drawers contain adjustable partitions, and will be found useful for the storage of articles in bulk. All fittings are brass. The height of these bases is 24 inches, and the cabinet with base is seven feet in height.



NOTE WITH WHAT EASE THE INTERIOR ARRANGEMENT OF THE DRAWERS CAN BE CHANGED

## SOME USERS

American Thread Co	New Jersey Zinc Co
American Honey Co	Norton Company
Ault & Wiborg Co	National Aniline & Chemical Co
American Hard Rubber Co	National Carbon Co
American Window Glass Co	National Malleable Castings Co
The Barrett Co	Newport Chemical Works
Butterworth Judson Corp	Ohio Match Co
Bessemer Limestone & Cement Co	Pennsylvania Rubber Co
Bristol Myers Co	Prest-O-Lite Co
Crucible Steel Co. of America	Procter & Gamble Co
Cheney Brothers, "Silks"	Pennsylvania Coal & Coke Co
College of City of New York	Redman Chemical Products Co
E. I. du Pont de Nemours & Co	Stanley Works
De Laval Separator Co	E. R. Squibb & Sons
Detroit Iron & Steel Co	Standard Oil Co
Eastern Malleable Iron Co	Strathmore Paper Co
Falk Co	M. P. Stevens & Sons
General Electric Co	Todd Shipyards Corp
General Tire & Rubber Co	U. S. War Dept
Great Western Sugar Co	U. S. Bureau of Chemistry
General Bakelite Co	U. S. Bureau of Fisheries
Garrett & Co., "Virginia Dairies"	U. S. Navy Dept
B. F. Goodrich Co	U. S. Public Health Service
Hershey Chocolate Co	U. S. Rubber Co
Hudson Motor Car Co	University of Illinois
Hyatt Roller Bearing Co	University of Michigan
Hercules Powder Co	University of Purdue
Hexwood Wakefield Co	University of Washington
Henry Heide, Inc	U. S. Aluminum Co
Hollingsworth & Whitney Co	Van Camp Packing Co
International Nickel Co	Victor Talking Machine Co
Kalbfleisch Corp	Wagner Electric Co
L. H. Lilly & Co	Westinghouse, Church, Kerr & Co
Lowell Textile School	W. Va. Pulp & Paper Co
Lloyd Mfg Co	Wisconsin Food Products
Murphy Varnish Co	Westinghouse Electric Products Co
Macbeth Evans Glass Co	Yale & Towne Mfg Co
Merck & Co	Yale University
Manhattan Rubber Co	
Milton Mfg Co	

# SCIENTIFIC INSTRUMENT CO.

Manufacturers, Importers and Exporters

239 East 11st Street  
NEW YORK, N. Y.



## PRODUCTS

Manufacturing and repairing of Scientific Instruments.

Polariscopes  
Microscopes  
Spectroscopes

Polariscope Accessories  
Analytical Balances

Repairing instruments used in

Surveying  
Astronomy  
Chemistry  
Physics  
Bacteriology  
Medicine, Etc.

Specialists in the design and development of Scientific Instruments.

Experimental Work in the above fields carried on in strict confidence.

## REPAIR DEPARTMENT

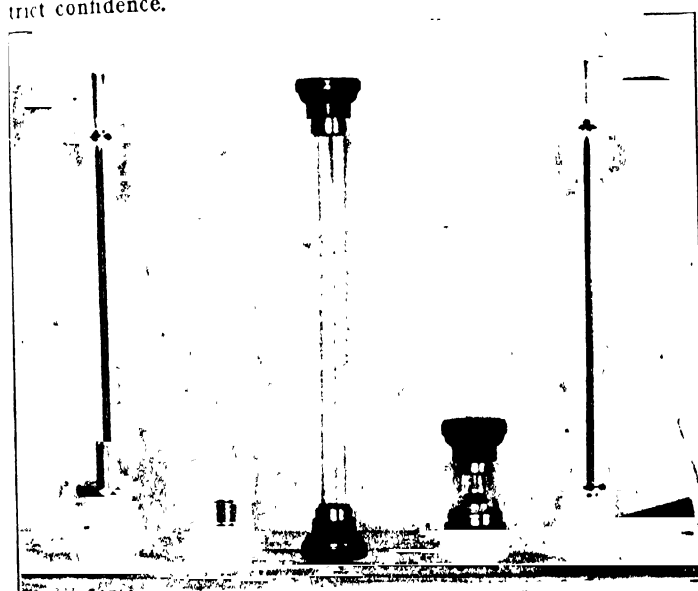
Our repair department has a number of men, expert in their separate fields, who are by experience capable of rebuilding or repairing any scientific instrument.

We have a wide clientele in many lines of repair work in the above classes of instruments, used in the chemical and allied industries, especially among users of polariscopes, microscopes, etc., etc.

## MANUFACTURING DEPARTMENT

While we do not build instruments to be sold by our company, we do manufacture them for laboratory supply houses, for chemical companies, and for schools, colleges, and universities.

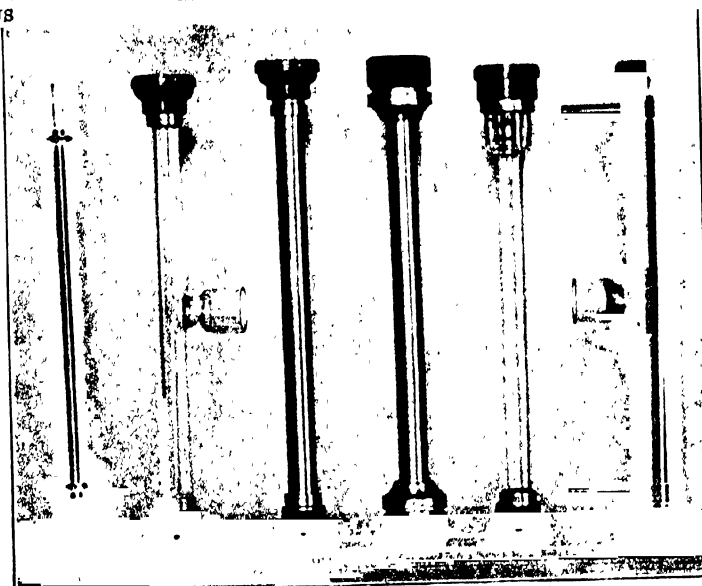
An example of our work is the Hess-Lives Tint Photometer, which we make for the Palo Company, as well as the Schreiner Colorimeter.



POLARISCOPE PARTS BUILT BY US

## EXPERIMENTAL WORK

We specialize in the design and development of scientific instruments used in the industries. This work is carried out entirely by our own organization, and is done in strict confidence.



POLARISCOPE PARTS REPAIRED BY US

# SCIENTIFIC UTILITIES COMPANY, INC.

Cable Address  
"SUCTION", New York

Telephone  
STUYVESANT 5439  
STUYVESANT 157

FACTORY  
84 East 10th St

Paris

London

Alexandria

Prague

Berlin

Mexico City

Manufacturers, Importers, Exporters  
18 East Sixteenth Street  
NEW YORK, N. Y.



## PRODUCTS

Laboratory apparatus of all kinds, for every need.  
Glassware.  
Scientific Instruments.  
Industrial Laboratory appliances, and accessories.  
C. P. Reagents of the Standard manufacturers.

## SERVICE

Our service includes supplying every known laboratory requirement. Our stocks are extremely large and complete. Write us and you will find that you are dealing with an organization experienced for years in supplying the wants of the laboratories in all industries.

## FACILITIES

We make special apparatus of Glass or Metal for these laboratories from their own designs. We have our own excellently equipped Glassblowing and Thermometer shops and a Metal Instrument factory in charge of experts. We specialize in the manufacture of Chemical hardware.

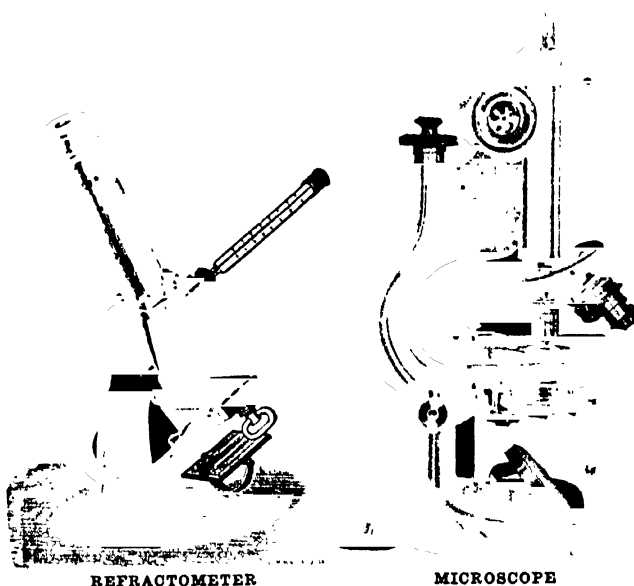
## REPAIR DEPARTMENT

This department makes repairs on all laboratory apparatus (Glass or Metal).

This work saves our customers many dollars in the purchase of new equipment. When you have a lot of equipment assembled for repairs ship it to us, and we will make each piece equal to new.

## SCIENTIFIC INSTRUMENTS

Microscopes, Polariscope, Refractometers and other accessories for investigations and researches are supplied by us promptly.

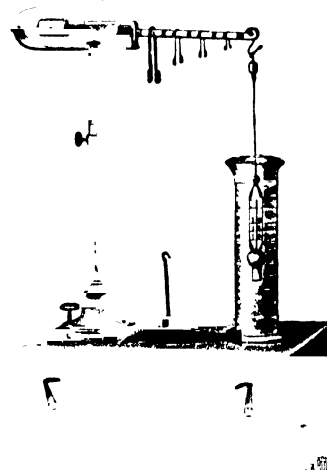


REFRACTOMETER

MICROSCOPE

## BALANCES AND WEIGHTS

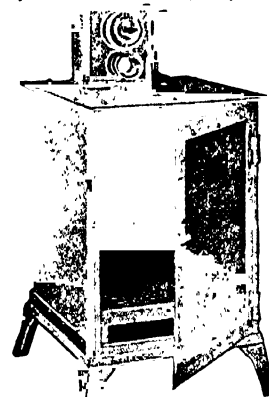
Beckers' Sons, Troemer's, Voland's, and our own Open Laboratory balances of all reliable makes, for rough weighing.



WESTPHAL BALANCE

## LABORATORY PUMPS

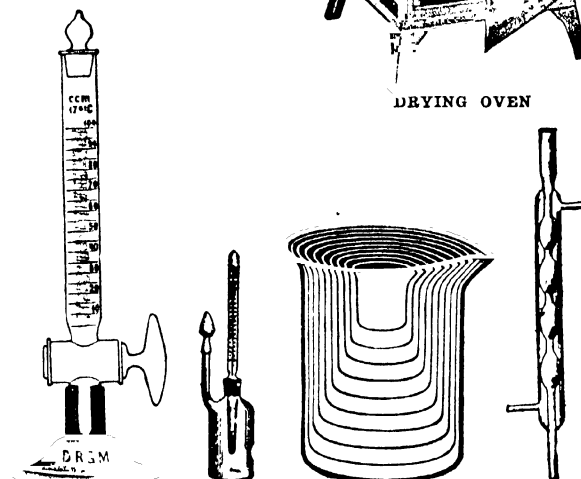
Many types of small pumps for handling liquids, vacuum pumps, hand or power driven for high vacuum, air pumps, filter pumps, etc., are supplied by us regularly to the largest industrial laboratories.



DRYING OVEN

## DRYING APPARATUS AND OVENS

Every standard equipment for the above work in laboratories.

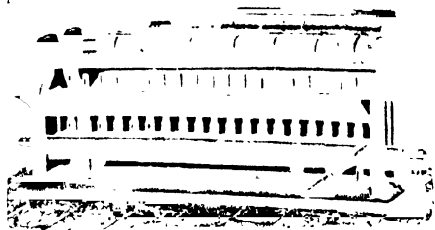


LABORATORY GLASS APPARATUS

Continued on Next Page

**FURNACES**

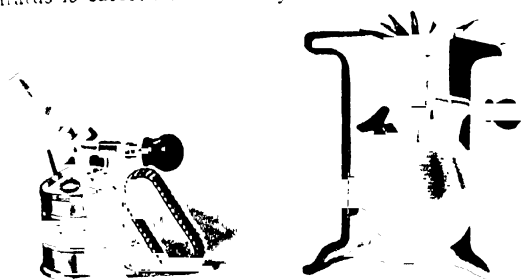
Laboratory furnaces of all standard designs for every possible need.



COMBUSTION FURNACE

**BLAST LAMPS AND BURNERS**

A complete line of these important pieces of apparatus is carried in stock by us.



BLAST LAMPS AND BURNERS

**THERMOMETERS**

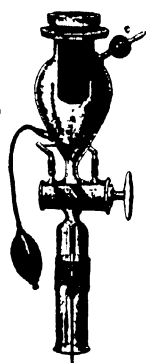
We have experts in our employ who make all types of scientifically accurate thermometers. We have experts on Beckman thermometers and others. We carry at all times a complete stock of industrial and laboratory instruments for general work.

**HYDROMETERS**

A complete stock of these instruments are always on hand to be used for liquids of every character. These hydrometers can be supplied weighted with shot or mercury, as well as a thermometer scale.

**NEW****AMPOULE FILLING APPARATUS**

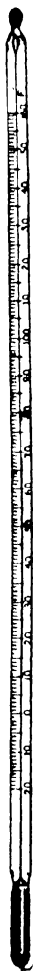
Made of Jena Glass, simple and easy to operate. Ampoules and Vials furnished in Jena hardglass, flint or amber.



AMPOULE Filling Apparatus



THERMOMETERS

**CENTRIFUGES**

Complete line of these important laboratory accessories, hand drive, belt drive, water drive, or motor drive, for centrifuging any product.



LABORATORY CENTRIFUGE

**PYROMETERS**

Standard types of these instruments can be supplied, including the electrical connections and other appurtenances.

**DISTILLING APPARATUS**

Of Metal or Glass for every laboratory use. Barnstead Automatic Water Still; James Water Still; Jewell Water Still; Kolbe's for liquids under reduced pressure, etc.

Glass Stills Our Specialty.

**SPECIFIC GRAVITY INSTRUMENTS**

Specific Gravity bottles of every type and any required c.c. capacity, together with thermometer stoppers. These instruments are standard and are graduated to the greatest accuracy.

**EXTRACTION APPARATUS**

Complete stocks of all the various standard designs are on hand.

Soxhlet, Freybling, Hagemann, Kempf, Kreussler, Lehmann, Breumer, Pip, Wiley, Kutscher and Stendel's, as well as the new Underwriter's form as described in the J. Ind. and Eng. Chem. IV. No. 7, June, 1912.

**GAS ANALYSIS APPARATUS**

All equipment necessary for this work can be supplied by us from stock.

**PLATINUM LABORATORY SUPPLIES**

These can be had from us. Crucibles, Cups, Dishes, Thermo-couples, as well as platinum lined calorimeters.

**MELTING AND FREEZING POINT APPARATUS**

Beckman's and other types.

**PORCELAIN AND RUBBER GOODS**

These supplies are carried in stock by us and cover every demand of the laboratory.

**CEMENT TESTING APPARATUS**

We are headquarters for the standard apparatus for testing cement, which includes all methods approved by the American Society of Testing Materials.

# ERNEST SCOTT & CO.

FALL RIVER, MASS.

KINGSWAY HOUSE, LONDON, ENG.

GLASGOW

BUENOS AIRES

COLOMBO

SINGAPORE

## PRODUCTS

Apparatus for Recovery of Coke-oven and Coal-tar Products—Benzol, Toluene, Sulphate of Ammonia, etc.

Caustic Soda Recovery Apparatus

Complete Plants for Distillation of Wood

Glycerine Recovery Apparatus; and Refining Apparatus

Oil Extraction and Recovery Apparatus

Paper-makers' Liquor Recovery Apparatus

Solvent Extractors; Solvent Recovery Apparatus

Autoclaves

Mixers

Digesters

Rotary Incinerators

Distilling Apparatus

Stills

Dryers

Vacuum Condensers

Filters

Vacuum Dryers

Impregnators

Vacuum Evaporators

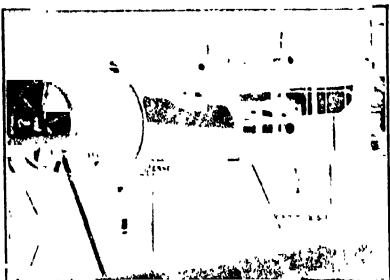
Insulators

Vacuum Pumps

Vacuum Melting and Digesting Apparatus

## OIL EXTRACTION AND RECOVERY

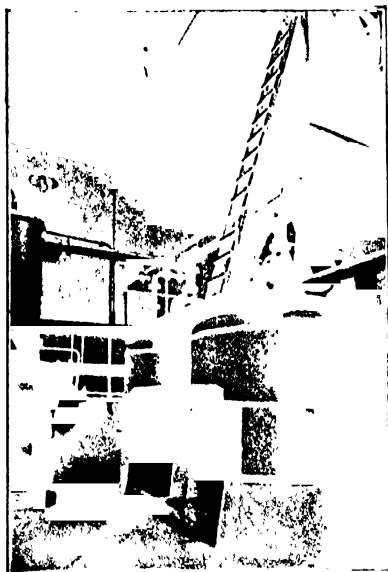
From packing house tankage, bones, seeds, leather scraps, skins, filter-press cakes, engine wipes, linters, cotton waste and residues of all kinds.



OIL EXTRACTION AND RECOVERY APPARATUS

## SOLVENT RECOVERY

From the processes of varnish and explosives manufactures, rubber-coating machinery, dry cleaners' spent spirit, etc.



SOLVENT EXTRACTION APPARATUS

## SULPHITE

### LIQUOR RECOVERY

These plants are similar to our soda recovery plants but are constructed of a specially treated acid metal guaranteed to withstand sulphite liquor.

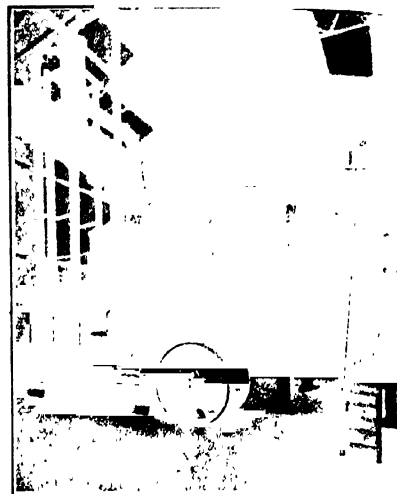
## DISTILLING APPARATUS

For dealing with fat, acids, oils, water, solvents, etc.

## VACUUM EVAPORATORS

For economically and rapidly concentrating all liquors. Any liquor dealt with. Several thousand installations now at work.

These plants are specially adapted for recovering caustic soda in pulp and paper mills and explosive plants and for treating the spent washings of mercerizing plants



VACUUM EVAPORATOR

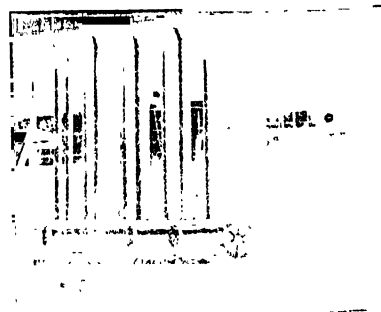
## VACUUM DRYERS

Stationary, rotary and continuous installations. The various types being specially designed for drying rubber, cocoa, coffee, fruit, vegetables, milk and other food products, fish, blood, glue, gelatine, seeds, grams, pencil and other woods, colors, dyes, extracts, etc.

## GLYCERINE RECOVERY

From soap lyes and Twitchell sweet water at a cost as low as \$7.50 per ton of glycerine, this allowing for fuel, labor and chemicals. Recovery can be obtained even more economically where exhaust steam is available. Multiple effect apparatus supplied for larger sizes.

Each equipment is a complete plant including tanks, pipes, filter press, steam-driven force pump, patent evaporator with all fittings including salt extractor, vapor pipes, catch vessel and fittings, jet condenser and steam-driven vacuum pump.



GLYCERINE REFINING APPARATUS

## GLYCERINE REFINING

These plants will yield Dynamite Glycerine in one distillation from Soap Makers' Glycerine and C. P. Glycerine in two distillations; from Saponification Glycerine C. P. Glycerine can be obtained in one distillation, from Distillation Glycerine partly C. P. Glycerine and partly Dynamite Glycerine can be obtained in one distillation at a cost of distillation of about \$5.00 per ton, the yield being within 2% of the actual quantity treated

# SCRANTON GLASS INSTRUMENT COMPANY

322 WASHINGTON AVENUE, SCRANTON, PA.

• 11 Madison Avenue, New York, N. Y.

815 Washington Blvd., Chicago, Ill.

Consolidated with  
**ACCURATE THERMOMETER COMPANY**  
**SCRANTON HYDROMETER COMPANY**  
**M. WEISKOPF THERMOMETER COMPANY**

## PRODUCTS

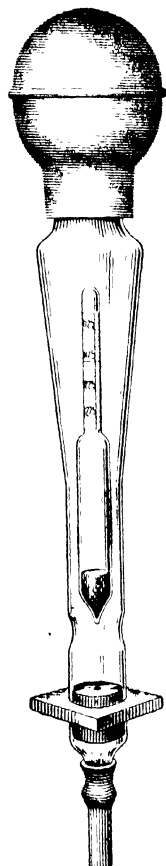
Hydrometers and Thermometers to meet all requirements.

## HYDROMETERS FOR ALL PURPOSES



**COMMERCIAL  
TYPE**

Baumé  
 Balling  
 Brix  
 Tralle  
 Twaddle  
 Internal Revenue  
 U. S. Custom House  
 Lime and Sulphur  
 Calcium Chloride  
 Battery (7 Types)  
 Oil  
 Ether  
 Gasoline  
 Glue  
 Glycerine  
 Milk  
 Naphtha  
 Salometer  
 Saccharometer  
 Specific Gravity  
 Syrup  
 Sugar  
 Urinometer  
 Pyro Alcohol Radi-  
 ometer  
 Ammonia  
 Actionometer  
 Chlorine  
 Lye  
 Shellac



**KANT STICK BAT-  
TERY HYDROMETER**

## THERMOMETERS FOR ALL PURPOSES



**MECHANICAL  
THERMOMETER**



**THERMOMETER  
FOR ICE MA-  
CHINES AND  
BRINE TANKS**

Armored  
 Beef Packer  
 Bakers  
 Bake-Oven  
 Battery  
 Brine Pipe  
 Calormeter  
 Canners  
 Chemical  
 Cold Storage  
 Confectioners  
 Dairy  
 Distillers  
 Dough Testing  
 Electric Alarm  
 Egg Room  
 Ice Machine  
 Glass  
 Kettle  
 Laboratory  
 Marine  
 Mash Tub  
 Oil  
 Packers  
 Picklers  
 Pocket  
 Precision  
 Railway  
 Shiphold  
 Sugar  
 Titer Test  
 Vulcanizing  
 Weather Bureau



**CHEMICAL  
THERMOMETER**



**COLD STORAGE  
ROOM  
THERMOMETER**

Brass Case  
 Bronze Case  
 Copper Case  
 Tin Case

## SPECIAL FEATURES

We make a specialty of imprinting your name in our various types of hydrometers and hydrometer syringes. We are also able to pack all instruments in individual metal edge fiber board boxes with your name and trade-mark imprinted on each box.

## SERVICE

The material used in the manufacture of our products is the best we can obtain. Our scales are made by experts. Every instrument is tested and retested before leaving the factory. Any instruments which are not satisfactory in every way are accepted in return by us and full credit is given.

## LITERATURE

Catalogs, Bulletins and Folders on application.



# SHEPARD ELECTRIC CRANE & HOIST CO.

## MONTOUR FALLS, NEW YORK



New York  
Baltimore  
Christiana

Philadelphia  
Cleveland  
Stockholm

Chicago  
San Francisco  
Barcelona

### BRANCH OFFICES

Cincinnati

Pittsburgh  
Montreal  
Genoa

Boston  
Melbourne  
Paris

London  
Hamburg  
Berlin

## PRODUCTS

Traveling Cranes to 50 tons capacity; Electric Hoists and Monorail Cranes  $\frac{1}{2}$  to 30 tons capacity; Double Monorail Tracks; Trolleys; Electric Back Geared Winches; Electric Cargo Winches; Electric Ship Winches; Electric Capstans.

## SHEPARD ELECTRIC CRANES AND HOISTS

**Construction**—Shepard Electric Cranes and Hoists are designed to meet the demand for a type of electric hoisting equipment equally adaptable to both indoor and outdoor service and requiring no unusual degree of skill for either its care or operation.

The hoisting mechanism of all Shepard Cranes and Hoists is of the "unit-construction" type. Electric motor, gearing, hoisting drum and brake are contained within a heavy iron housing that is not only dirt, dust and moisture proof but safeguards all operative parts from fumes and injury. Another important feature is that the operating gears run in oil baths.

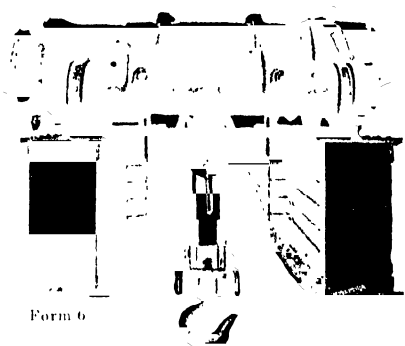


BRIDGE CONSTRUCTION

The Shepard idea of providing complete protection and automatic lubrication is carried throughout Shepard Cranes.

## SHEPARD STANDARD TYPE CRANE TROLLEY

The Trolley illustrated herewith provides a bath lubrication, complete dirt exclusion and permanent alignment for the gearing, brakes and motor.



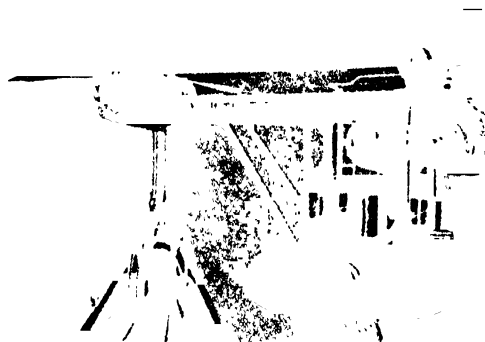
Form 6

SHEPARD STANDARD TYPE CRANE TROLLEY

## SHEPARD MONORAIL ELECTRIC HOISTS

**Cage Controlled Hoists**—These Hoists equipped with automatic buckets are widely used in many lines of industry for rehandling coal, raw products and other materials. Shepard enclosed trolley and gears and bath lubrication is of supreme importance for this service.

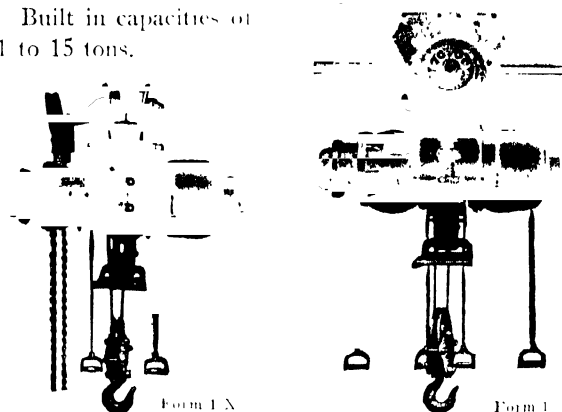
**Floor Controlled D. C. Hoist**—This Hoist consists of a motor driven geared trolley. Especially useful where loads must be carried distances too long for the workmen to push along the I-beam track.



SHEPARD CAGE CONTROLLED MONORAIL ELECTRIC HOIST

The illustrations below show two forms of Shepard Monorail Hoists; one with the axis of the winding drum parallel to the line of the travel and the other at right angles to it.

Built in capacities of 1 to 15 tons.



Form 1A

Form 1

SHEPARD FLOOR CONTROLLED MONORAIL ELECTRIC HOISTS

## MONORAIL SYSTEMS

We furnish switches, tracks and complete equipment for Monorail systems.

## ENGINEERING SERVICE

We offer the free services of our engineers in aiding to solve any hoisting or rehandling problem.

## CATALOGS OF VARIOUS TYPES

A few typical Shepard Cranes and Hoists are shown here but an idea of the scope of our line may best be obtained by sending for Catalog which illustrates Traveling Cranes, Monorail Cranes, Winches, and various applications of electric hoists.



MONORAIL CONSTRUCTION



# SHERWOOD MANUFACTURING COMPANY

Brass Founders and Finishers

SOLE MANUFACTURERS OF

SHERWOOD ENGINEERING SPECIALTIES

1702-1716 ELMWOOD AVENUE, BUFFALO, N. Y.

BRANCH OFFICES

York 220 Broadway

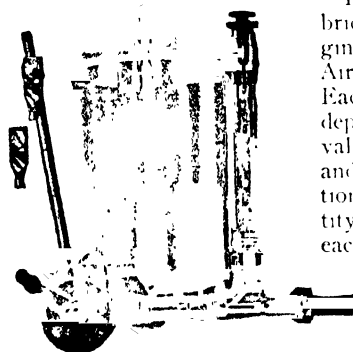
Boston 40 Federal Street

London Green & Building Ltd., 28 New Bridge Street, E. C.

## PRODUCTS

Sherwood and Buffalo Automatic Injectors, Eagle Ejectors, Hart Force Feed Oil Pumps, Felthousen Hand Cylinder Oil Pumps, Buffalo Cylinder Oil Pumps, Buffalo Glass Body Oil Cups, Niagara and Sherwood Oil and Grease Cups, Engineer's Favorite and Duplex Flue Scrapers, Favorite Steam Flue Blowers, Felthousen Ball Gauge Cocks, Oxygen and CO<sub>2</sub> Cylinder Valves, Machined Brass Work to Specifications and Brass and Bronze Castings.

### "HART" FORCE SIGHT FEED OIL PUMP



SINGLE FEED

For Force Feed Lubrication of Steam Engines, Steam Pumps, Air Compressors, etc. Each sight feed has independent needle valve, permitting fine and accurate regulation of minimum quantity of oil required at each point of lubrication, and eliminating waste. Plungers have constant length stroke, regardless of amount of oil

fed to cylinders or bearings. Large, easy reading sight feed glass, always at atmospheric pressure. All "Hart" Pumps tested against steam pressure before shipment.

Capacity of "Hart" pumps is  $\frac{1}{2}$  pint to 1 gallon. The "Hart" is made in four styles. Polished brass finish, nickel plated, rough brass finish, and glass body. The pump is built with one, two, three, four and five feeds.

### ACID EJECTORS FOR CHEMICAL WORKS

Operated by steam pressure. Iron body lined with hard lead.

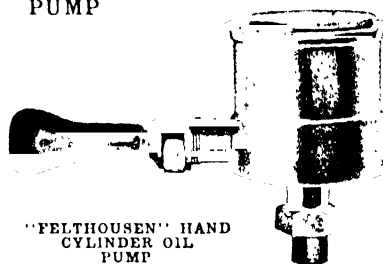
This appliance is made to handle sulphuric acid or any other liquids that attack iron or brass.

It is recommended that the ejector be located a foot or two above the liquid, so that the acid or other liquid which has to be lifted by the ejector will drain out when not in use.

#### DIMENSIONS

Size of Pipes		Capacity per Hour, Gallons
Steam	Liquid	
$\frac{1}{2}$ or $\frac{3}{4}$ in.	1 in.	425
$\frac{3}{4}$ or 1 in.	1 $\frac{1}{4}$ in.	1050
1 in.	2 in.	2600

### THE "FELTHOUSEN" HAND CYLINDER OIL PUMP



"FELTHOUSEN" HAND CYLINDER OIL PUMP

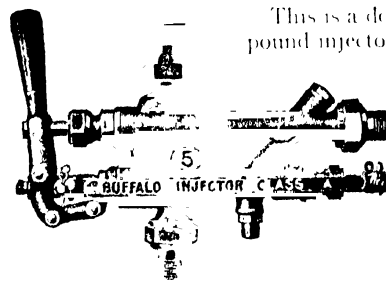
For lubricating cylinders of engines and steam pumps, etc.; so simple in construction that anyone can readily understand how to use them. These pumps have two

check valves between oil and steam. Perfectly made and elegant in finish. Many thousands of these oil pumps are in use giving perfect satisfaction. Every engine should have one of these pumps whether it is provided with an automatic lubricator or not.

#### DIMENSIONS

	Brass Body				Glass Body			
No. Side Outlet	1	0 1	1	8	5	3	0 1	4
Bottom Outlet	0 1	0 6	7	9	5	0 1	6	7
Capacity in Pints	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	1	$\frac{1}{2}$	$\frac{1}{2}$	1
Pipe Thread in Inches	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	1	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{2}$

### THE "SHERWOOD" INJECTOR, CLASS "A"



This is a double tube or compound injector, comprising two sets of jets, one set acting as an ejector, lifting water and supplying same to the second set of jets which do the forcing.

The "Sherwood" Class "A" Injector is operated by one lever, and works on any pressure from

25 to 200 lbs. or more. Will lift water 24 feet under proper conditions, and will handle hot water. It requires no valve in either steam or suction pipe, it is easy to connect and easy to operate, and is recommended where a wide range of work is required.

#### DIMENSIONS

Size	Size Connections		Gallons per Hour	Horse Power
	Suction and Delivery	Steam		
5	$\frac{1}{2}$	$\frac{1}{2}$	140	8 to 12
5 $\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	180	12 to 25
7	$\frac{3}{4}$	$\frac{3}{4}$	250	20 to 35
9	$\frac{3}{4}$	$\frac{3}{4}$	350	30 to 45
9 $\frac{1}{2}$	1	$\frac{3}{4}$	450	40 to 60
11	1	1	575	60 to 80
13	1 $\frac{1}{4}$	1	725	75 to 100
13 $\frac{1}{2}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	900	90 to 125
15	1 $\frac{1}{2}$	1 $\frac{1}{4}$	1260	120 to 175
15 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{4}$	1700	150 to 235
17	2	1 $\frac{1}{2}$	2200	200 to 300
19	2	1 $\frac{1}{2}$	2800	250 to 360
21	2 $\frac{1}{2}$	1 $\frac{1}{2}$	3500	350 to 500
23	3	2	5000	750 to 950

# T. SHRIVER & COMPANY

Established 1899

Filtration Engineers and Manufacturers of Filter Presses

851 HAMILTON ST., HARRISON, N. J.

## PRODUCTS

Filter Presses of all kinds for all purposes; Filter Cloth; Filter Paper; and Filter Press Pumps.

## SERVICES

While this catalog shows many different types and sizes of our standard filter presses, nevertheless, we are continually required to design filter presses for special purposes, and our experience in this line is at your disposal.

If you have a product that can not be filtered by ordinary methods, call upon us. In any event, do not abandon the idea of filtering your material until we have had an opportunity to investigate it.

Our success in special filter presses has made us headquarters for customers who have encountered problems which they have been unable to solve.

We solicit your patronage and make no charge for our experiments.

## CONSTRUCTION FEATURES

**Drainage Surface**—All Shriver filter plates are made with the improved pyramid drainage surface. This surface is over 30% more efficient than any other type of drainage, as it holds the cloth away from the surface of the plate, allowing free passage of the filtrate through and back of the cloth.

**Leakage**—The plates and frames of Shriver presses are machined on specially constructed tools which assure absolutely even, parallel joint surfaces, file finished, and accurate.

**Outlet Cocks**—Our standard quick-action flap cock is recommended for filter press outlets. When closed they withstand a pressure of 200 lbs. per sq. in. without leakage. Other styles of outlet cocks are supplied on some of our special designs of presses.

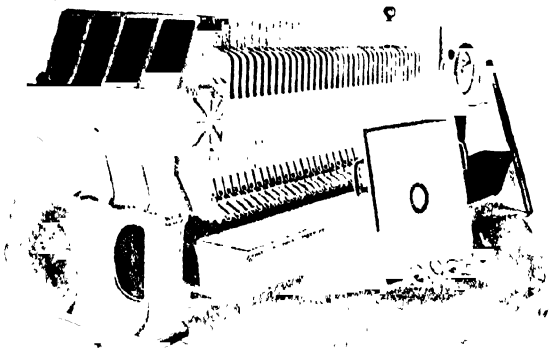
**Opening and Closing Devices**—Our hand operated device for opening and closing the press is simple to work and is quick. The larger presses are equipped with gear and pinion closing device together with the ratchet, insuring absolutely tight closing with little exertion.

Where there are large installations such as a battery of presses we recommend our Hydraulic Closing Device by which the whole battery can be opened or shut in one operation.

## TYPES

The results that will be obtained from any application of filter presses is determined largely by the selection of the type of machine best adapted to the work for which it is intended.

**Type B**—Square, Center Feed, Open Delivery, Non-washing, Recessed Plate Filter Press. The Center



TYPE B

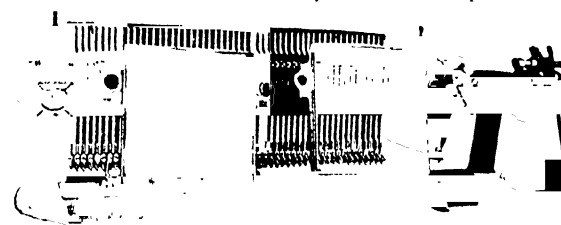
Feed Press finds extensive application in processes where washing of the cake is unnecessary and in the filtration of very thick material which might tend to clog the ports of the flush plate and frame types described later.

The solution to be filtered is pumped into the chambers through the channel in the center of the feed. Distance frames are supplied when it is desired to filter cakes more than 1 1/4 inches thick.

**Type C**—Square, Center Feed, Open Delivery, Washing, Recessed Plate Filter Press. This type is identical in construction and operation with Type B, but is provided with a special washing channel for washing the cake remaining in the press.

**Type D**—Side Feed, Open Delivery, Non-washing, Flush Plate and Frame Filter Press. This Side Feed Filter Press is the same in design as Type E, excepting that there is no provision made for washing the cakes in the press. This type of press is particularly adaptable to the filtration of vegetable oils and the clarification of liquids wherein the use of paper as a filtering medium is desired.

**Type E**—Square, Side Feed, Open Delivery, Washing, Flush Plate and Frame Filter Press. The Side Feed Filter Press is probably the most improved and



TYPE E. SIDE FEED FILTER PRESS

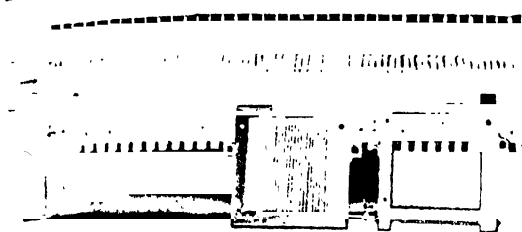
highest developed filter press on the market. The many features of superiority of this type over all others received instant recognition and resulted in the almost universal adoption of this type wherever its application has been possible.

The chambers are formed by distance frames placed between the flush plates and may be varied by using frames of different thickness. This design makes it unnecessary to cut holes in the cloths and the clothing of the press is a simple operation. It is only necessary to cut the cloths to the proper lengths and fold them over each plate.

**Type F**—Square, Corner Feed, Two-Eyed, Open Delivery, Washing, Flush Plate and Frame Filter Press. In this type an eye or hole in one corner of the plates and frames forms a channel for the introduction of material to be filtered. Another eye in the opposite corner serves for the washing or lixiviation process. Frames can be made for cakes of any desired thickness.

Paper as well as cloth can be used as a filtering medium and the press is easily clothed by folding the cloths over the plates, no fasteners being required. Holes are cut in the cloths to correspond with the holes in the plates.

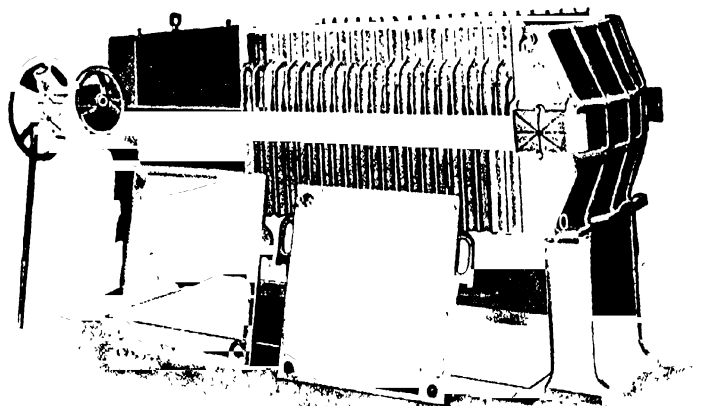
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TYPE K. WOODEN CHAMBER FILTER PRESS

**Type G**—Square, Corner Feed, Three-Eyed, Closed Delivery, Flush Plate and Frame Filter Press. The Three-eyed Press is particularly adapted to the filtration of volatile liquids, as the filtrate is discharged through a channel at one corner of the head and, therefore, can be kept from exposure to the atmosphere.

**Type H**—Square, Corner Feed, Four-Eyed, Washing, Flush Plate and Frame Filter Press. The Shriver Four-eyed Press is a closed delivery washing press



TYPE G

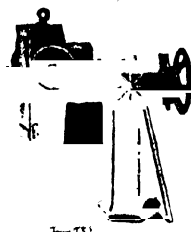
which meets every emergency to which a filter press can be put. Frames can be made of any depth to produce cakes of the required thickness. The cakes can be washed or treated with chemicals while in the press.

The filtrate is delivered through a closed channel, permitting the filtering of volatile liquids.

**Type K**—Wooden Chamber Filter Press. In the many varied branches of chemical industry of to-day, it is frequently necessary to effect the rapid filtration and clarification of acid solutions or materials influenced by contact with iron.

The Shriver Wooden Chamber Filter Press stands foremost in the field of acid filtration. It is so constructed that the solution being filtered does not come in contact with anything but wood or acid-resisting material at any time during the process of operation. The plates and frames are usually made of selected yellow pine, but can be constructed of any wood that may be desired for any special work. Shriver Wooden Chamber Filter Presses are made in all types, sizes and capacities.

Especially attention may be called to the new



Shriver panel type of plate only recently perfected. The plates are made with a loose center internal expansion feature which greatly minimizes the customary changes caused by the drying and swelling of the wood. These plates are provided with the double washing feature which effects a rapid and thorough washing of the cake.

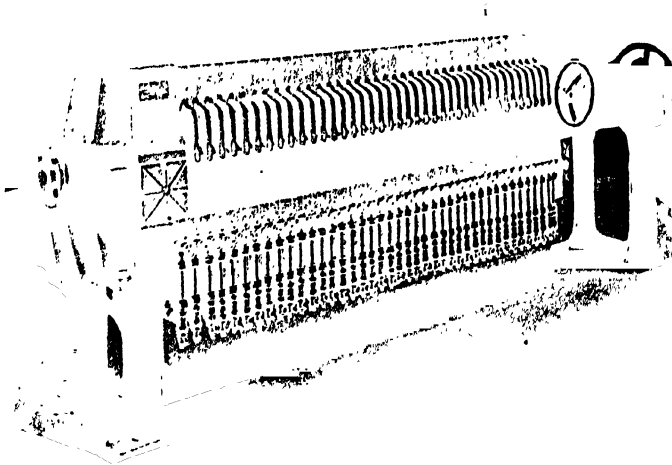
**Type L**—New Model Varnish Filter. This press is a square, three-eyed, flush plate and frame

type filter press equipped with solid, slightly recessed frames which reduce the holding capacity over 87 per cent without lessening the filtering area.

After filtration the Varnish remaining in the chambers of the press, being small in quantity on account of the solid frames, is filtered through an auxiliary chamber which holds about three gallons. After filtering the varnish from the main body of the press through this chamber until filtration ceases, the un-

filtered Varnish is drawn off through an outlet cock provided for this purpose, leaving only about three gallons of unfiltered Varnish from a batch.

**Type B-S**—Center Feed Closed Delivery Visible Discharge Filter Press. The Closed Delivery Visible Discharge Filter Press is equipped with a gauge glass, valve, and pet cock on each plate. The filtrate passes through the gauge glass before entering the common outflow channel. Should a cloth break, causing the liquor to run cloudy, this condition is plainly seen by the operator and the filtrate from that chamber can be shut off by closing a valve just above the gauge glass, without interrupting the action of the remaining chambers.



TYPE B-S

### FILTER PRESS PUMPS

There is no more important item in a filter press installation than the apparatus which is best suited to pump the liquid to the presses. We have the best pumps for our types of filter press. They can be steam, motor, or belt driven.



## SIMMONS PIPE BENDING WORKS

Main Office: 10 Mechanic Street  
 Factory and Warehouse: Avenue D and Murray Street  
 NEWARK, N. J.

### PRODUCTS

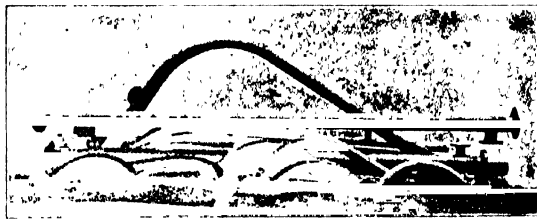
Pipe Bends  
 Pipe Coils  
 Van Stone Joints  
 Piping Specialties

### SERVICES

We have complete engineering and fabricating facilities for carrying out the largest of piping installations and we give the same attention to the small order. Upon request we will gladly furnish estimates from your specifications.

### BENDS

We make a specialty of Pipe Bends from special pipe manufactured for this purpose. These bends can be produced by us in any size and shape for high and low pressures. Where desired the ends can be swaged down and the nozzles welded in any position, to fit any kettle, tank or other apparatus.



A GROUP OF OUR BENDS AND FLANGED PIPE

### PIPE COILS

Made in steel, iron, brass or copper pipe. We are building these coils for use in a number of different industrial operations where special conditions are encountered in each installation. These coils can be built to your specifications.

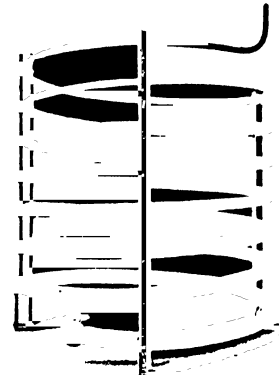


OBLONG TAPER COIL

BASKET COIL

### REDUCING COILS

These coils are built for every industrial use. Uniform reduction in diameter of the coil throughout its length gives maximum efficiency and freedom from pockets where condensed vapors could become entrained.



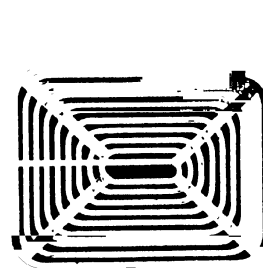
REDUCING COIL



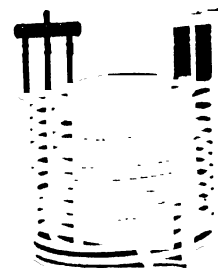
WATER HEATER AND COIL

### AUTOCLAVES

We build Autoclaves with the outer shell of any size up to 30 inches, with the coil made up and welded



FLAT COIL



CONDENSER COIL

# THE ORVILLE SIMPSON COMPANY

Manufacturers of Grinding and Sifting Machinery

1250 KNOWTON ST., CINCINNATI, O.

EXPORT OFFICE: 3 Cedar St., New York

## PRODUCTS

Roller Mills, Crushers, Buhr Stone Mills, Centrifugal Bolting Reels, Hexagon Bolting Reels, Rotex Sifters, Dufour Silk Bolting Cloth, Wire Cloth, Mortise Gearing, Conveyors, Elevators and Mill Supplies. French Buhr and American Buhr Mill Stones.

We make a specialty of grinding and corrugating rolls used in roller mills, paint mills, ink mills, etc.

## RAINBOW CRUSHER

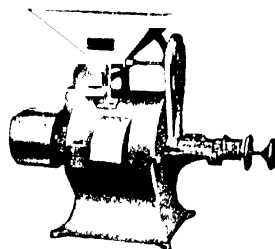
Our Rainbow Crusher is an ideal machine for reducing Filter Press Cakes, Clays, Chemicals, and all materials requiring crushing before being pulverized. Crushing cones can be readily changed when worn. Has large capacity and crushing fineness can be easily regulated when running.



RAINBOW CRUSHER  
13" x 16" x 16" Capacity

## EXPORT BUHR MILL

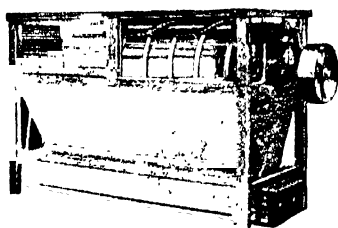
Made in three sizes with vertical French Buhr stones 15", 18" and 20" in diameter. Discharges at side or bottom. Designed for rapid grinding of Chemicals, Drugs, Food Products, Minerals, Paints, etc. Other buhr mills built with stones from 6" diameter up to 48" diameter.



EXPORT MILL  
15", 18" and 21" Stones

## DUNLAP CENTRIFUGAL REEL

A reel with a cloth stretch ring, brushes inside and outside of bolting cloth and a tight inside cylinder. Suitable for bolting Dry Chemicals, sulphur, starch, face powders, and all similar products. This machine is positive in its bolting action and will handle the most difficult materials.



DUNLAP CENTRIFUGAL REEL

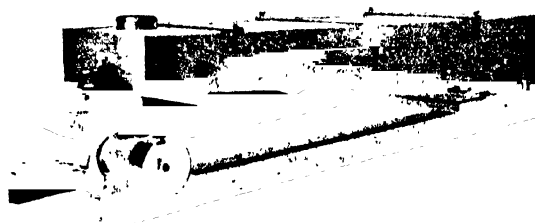
### DIMENSIONS AND PRICES

Size	No. 2	No. 3	No. 4
Length of Frame	6'8"	8'4"	8'6 1/2"
Length over all	8'1"	9'8 1/2"	11'4"
Height of Frame	4'3 1/2"	4'3 1/2"	5'5"
Width of Frame	2'9 1/2"	2'9 1/2"	3'6"
Diameter of Reel	26"	26"	34"
Circumference of Reel	82"	82"	107"
Length of Cloth	65"	87"	87"
List Price, Subject to Discount	\$220.00	\$250.00	\$280.00

Reel cloths not included in above prices.  
When ordering, specify right or left hand machine.

## ROTEX

The Compact Sifter



NO. 76 A 1 ROTEX

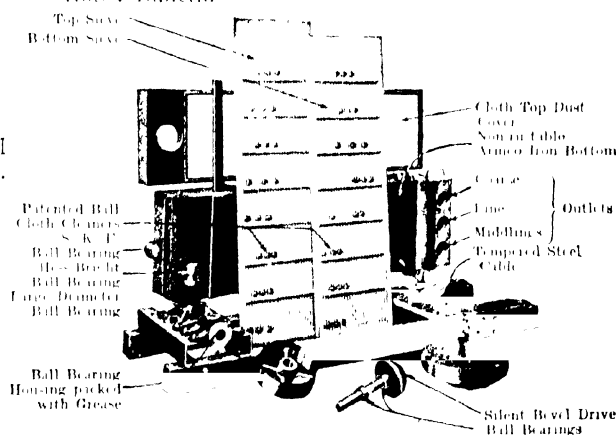
The Rotex Sifter operates with a level rotary sieve motion and incorporates a patented ball cloth cleaning device rendering it suitable for sifting fine, soft and sticky materials.

The Rotex is very compact, is easily installed, requires very little power and is dependable. The convenience of the removable sieves in the Rotex and the fact that even the finest mesh sieves do not clog on account of the thorough tapping action of the patent ball cloth cleaners, contribute to make the Rotex particularly suitable for chemists' use.

Soda, salts, oxides, alum, talc, chalk, graphite, bone, earthen, and all dry products are readily sifted.

The Rotex is built in several sizes for making two or more separations. An all metal Rotex is built for wet sifting.

The driving mechanism is mounted on five high grade ball bearings which eliminate mechanical troubles and reduce power consumption. Write for Rotex Bulletin



ROTEX UNASSEMBLED SHOWING PARTS

### DIMENSIONS AND PRICES

Size	76 A 1	76 E 1	19 A 1	49-B 1
Number of Sieves	2	1	2	2
Square Feet of Cloth or Screen	216	233	95	88
Number of Separations	3	2	3	2
Extreme Height, Inches	27	27	24	27
Width, Pulley at Side, Inches	30 3/4	54	24	24
Length, Pulley at Side	7'10"	8'6"	5'5"	5'5"
Shipping Weight, Lbs.	500	700	250	250
List Price, Subject to Discount	\$315.00	\$360.00	\$95.00	\$100.00

# THE SMITH GAS ENGINEERING CO.

Builders of Smith Gas Producer Plants

DAYTON, OHIO

SOLE CANADIAN REPRESENTATIVES: CANADIAN ALLEN CHAMBERS, LTD. TORONTO, ONTARIO

## PRODUCTS

**Producer Gas Plants to operate on bituminous coal, anthracite coal, coke, charcoal and lignite. Producer Gas Power Plants to operate on the above fuels. Producer Gas Fuel Plants to furnish clean gas for metallurgical and chemical operations and processes requiring the application of heat.**

**Gas Cleaning Plants.**

**Smith Glass Wool Tar Extractors.**

**Recording Gas Calorimeters.**

**Gas Valves.**

## EXPERIENCE

The Smith Gas Engineering Co. is a pioneer in gas producer work, Smith suction gas producers having been in successful commercial operation since 1902. Over 100,000 h.p. have been installed, ranging in size from 25 to 3,000 h.p. in single units, operating on a wide range of fuels, and furnishing gas for both power and heating. The company numbers among its customers some of the largest and best known manufacturers in the country, who installed Smith producers after thorough and detailed examinations by their own engineers, which showed the remarkable economies to be obtained by their use.

## ECONOMY

The increasing scarcity of fuels of all kinds, particularly oil and natural gas which are so extensively used by chemical plants, makes it imperative for every industry to use the most economical fuel in the most efficient manner. Producer-gas is to-day firmly established as a highly efficient agent for industrial heating and (when used with the gas engine) for power. Since it is a direct product of coal the most widely distributed and, basically, the most economical fuel, its continued economy is insured.

## COLD CLEANED GAS

All Smith plants supply a uniform quality of cleaned gas which can be distributed from one central plant to any distant point just as natural or city gas is distributed; no large refractory ducts are necessary as when "hot" or "raw" gas is used; no clogging of mains.

## SPECIAL FEATURES

(a) All Smith Gas Plants operating on bituminous coal or lignite are equipped with the Smith Glass Wool Tar Extractor guaranteed to be 99.5% efficient.

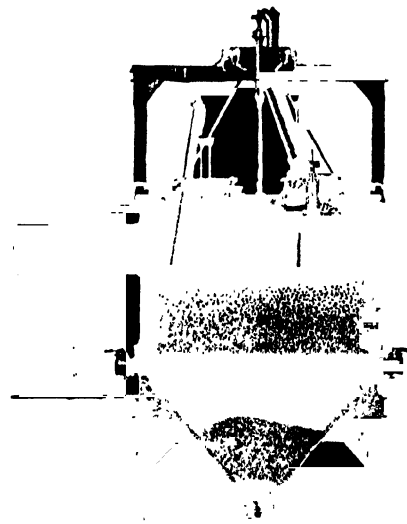
(b) All tar extracted from the gas is returned to the producer and converted into a fixed gas. This adds greatly to the over-all efficiency of the plant and the quality of the gas delivered.

(c) All Smith producers are equipped with automatic means of proportioning air and water vapor in the blast. This insures a very uniform gas quality on varying loads.

## HEAVY-DUTY PRODUCERS FOR BITUMINOUS COALS (Type "G")

The Type "G" is a high-duty bituminous producer, mechanically operated to meet the present day de-

mand for large gas capacity with low labor. The process of gas production is similar to the other Smith Plants and the Smith Glass Wool Extractor (Type "F") is used to clean the gas.



SECTIONAL VIEW OF 16' SMITH TYPE "G" PRODUCER EQUIPPED WITH MECHANICAL COAL FEED AND STEAM OPERATED POKERS

Producers Built in Three Sizes

A steam operated poker is incorporated in a rotating turret mounted on the producer top, which top also revolves. As the turret and top rotate, the poker constantly pierces the fuel bed so that every portion is poked during a complete revolution. The illustration shows the position of the poker when withdrawn and the dotted lines indicate its position when extended. The diagram shows how effectively the mechanical poking device does its work. Mechanical poking permits a higher rate of gasification and insures a more uniform porosity in the fuel bed than is possible with the hand poked type of producer, with the result that distillation is more thorough and efficiency consequently higher.

Type "G" units are made in sizes of 9 to 16 ft. diameter, capacities 800 to 3000 lbs. of coal per hour. Described in Bulletin 16.

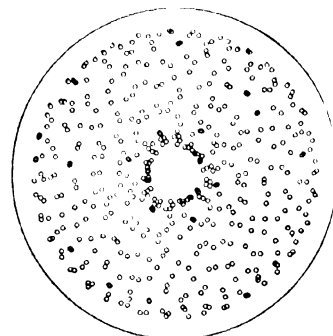


DIAGRAM SHOWING AUTOMATIC POKER OPERATION FOR ONE HOUR OF OPERATION, NOTE THOROUGHNESS OF POKING.

*Continued on Next Page*

**HAND OPERATED PRODUCER FOR BITUMINOUS COALS AND LIGNITE (TYPE "BF")**

The "BF" producer is designed to operate on bituminous and lignite coals. The cleaning equipment consists of the Type "F" tar extractor (illustrated) in addition to usual type of baffle scrubber. A scrubber is used only to cool the gas. Gas is



**DISMANTLED VIEW OF THE SMITH TYPE "F" TAR EXTRACTOR**

Showing Diaphragm and Glass Wool

drawn from the producer by a positive exhaustor and forced through the Type "F" tar extractor. The tar enters this diaphragm in the form of fog floating in the gas. During its passage through the diaphragm it is agglomerated into large drops which fall out of the gas current, by gravity, into trap provided for that purpose. Described in Bulletin 17.

**OTHER TYPES OF PRODUCERS**

Type "L" Producer is designed to operate on anthracite.

Type "EP" Producer is designed to operate on charcoal or coke.

**PRACTICAL USES FOR SMITH CLEANED GASES**

Smith Producer Gas is widely used in the chemical industry for roasting dyes, distilling and evaporating liquors, oils, etc., electrochemical operations, and for lead furnaces; also for a wide range of metallurgical services and industrial heating and cooking in general.

When used in efficient producer gas engines the fuel consumption does not exceed  $1\frac{1}{4}$  to  $1\frac{1}{2}$  lbs. per B.H.P. hour except in the case of lignite, when the fuel consumption will average 2 to  $2\frac{1}{2}$  lbs. because of the high moisture content of this fuel.

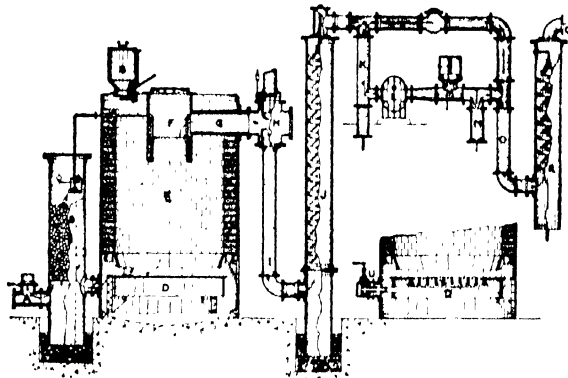
In chemical plants gas from a central plant is often used for both power and industrial heating.

**SIZES OF HAND OPERATED PRODUCERS**

Outside Dia.	B.T.U. Rating	Normal H.P.
12	2,000,000 per hr.	75
18	2,500,000	100
24	3,000,000	125
30	3,500,000	150
36	4,000,000	175
42	4,500,000	200
48	5,000,000	225
54	5,500,000	250
60	6,000,000	275
66	6,500,000	300
72	7,000,000	325
78	7,500,000	350
84	8,000,000	375
90	8,500,000	400
96	9,000,000	425
102	9,500,000	450
108	10,000,000	475

**GUARANTEES**

Smith Gas Plants are guaranteed to deliver in gas 70 to 75 per cent of the heating value of the fuel burned. When operated at rated load the gas value is guaranteed to be not less than 130 to 140 B.T.U. per cu. ft., depending on the kind of fuel used.



**DIAGRAM SHOWING OPERATION OF TYPICAL PLANT**

The air enters at (A), passes through the saturator (B), where it becomes saturated with moisture, and is discharged under the grate (C). The saturated air passes into the generator or producer proper (D), where the gas making occurs, and the gas is drawn off through the offtake (E), main (F) and downcomer (G) and discharged at the base of the primary condenser (H). The valve shown at (H) is for closing off the downcomer (F) and opening the vent to the atmosphere where the plant is idle.

The gas passing up through the primary condenser (H) is partially cooled and some of the heavier impurities are removed by the water sprayed in at the top. From (I) the gas passes through the pipe (K) to a rotary gas exchanger (L), tar extractor (M), and pipe (O) to the secondary condenser (R). The secondary condenser (R) is similar in general construction to the primary condenser and cools the gas to room temperature. The clean, cool gas is discharged at (Q) under whatever pressure is advisable and is piped where needed. The tar removed from the gas by the tar extractor is collected in (N).

**A LIST OF TYPICAL INSTALLATIONS OF SMITH PRODUCERS**

Name of Plant	Address	Fuel Used	Gas Used for	Capacity	Number of Repeat Orders
E. I. DuPont de Nemours & Co.	Wilmington, Del.	Penna. Bituminous	Heating in Chemical Processes	27,000,000 B.T.U. per hr.	1
Crucible Steel Co. of Amer.	Harrison, N. J.	Penna. Bituminous	Heavy Forging Furnaces	108,000,000 " "	"
Union Lamp Works	Harrison, N. J.	Penna. Bituminous	Glass Furnaces	6,000,000 " "	1
Blond Steel Co.	Syracuse, N. Y.	Penna. Bituminous	Billet Heating, Heat Treating	80,000,000 " "	3
Union Carbide & America	Niagara Falls, N. Y.	Penna. Bituminous	Reheating	10,000,000 " "	"
National Carbon Co.	Cleveland, Ohio	W. Va. Bituminous	Carbon Baking	70,000,000 " "	"
Atlas Glass Co.	Washington, Pa.	Penna. Bituminous	Glass Furnaces	175,000,000 " "	2
Horton Ice Cream Co.	New York City	Penna. Anthracite	Gas Power Plant	900 H.P.	1
McCoy Manufacturing Co.	Columbus	Bituminous	Power Heating Furnaces and Core Ovens	36,000,000 B.T.U. per hr.	"
Robins & Myers Co.	Springfield, Ohio	Ohio Bituminous	Japanning Heat Treating Soldering	9,000,000 " "	1
Dayton Engr. Lab. Co.	Dayton, Ohio	W. Va. Bituminous	Heat Treating Annealing Carburizing	19,000,000 " "	"
Ford Motor Co.	Detroit, Mich.	Bituminous	Power Heating Furnaces Japanning	325,000,000 " "	3
The San Antonio Portland Cement Co.	San Antonio, Tex.	Tex. Lignite	Gas Power Plant	1,600 H.P.	2
Dakota Light & Power Co.	St. Paul, Minn.	Anthracite	Gas Power Central Stations	650 " "	2
Bellogg Toasted Corn Flake Co.	Battle Creek, Mich.	Anthracite	Baking Cereal Food Products	24,000,000 B.T.U. per hr.	2
Organic Salt & Acid Co.	Newark, N. J.	Anthracite	Heating in Chemical Processes	4,000,000 " "	"
The S. East Iron Pipe & Foundry Co.	Bessemer, Ala.	Ala. Bituminous	Mold Drying and Core Baking	22,000,000 " "	"
The Norwottuck Silk Co.	Leeds, Mass.	Pa. Anthracite	Industrial Power Plant	600 H.P.	1

# SMITH & SERRELL

General Sales Agents

12 CENTRAL AVE., NEWARK, N. J.

DISTRICT OFFICES: CLEVELAND, 491 CENTURY BLDG

PITTSBURGH, 633 ELTON BLDG

**FRANCKE**  
FLEXIBLE COUPLINGS  
FOR DIRECT SHAFT DRIVES

**PINTITE**  
RIGID COUPLINGS  
FOR LINE SHAFTS

## PRODUCTS

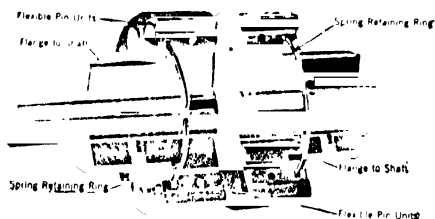
**"Francke" Flexible Couplings, for Direct Shaft Drives.**

- Heavy Pattern Type
- Double, Floating Ring Type
- Marine Type
- Small Power, Light Duty Type
- Magneto Type

**"Pintite" Rigid Couplings, for Line Shafting.**

## HEAVY PATTERN TYPE FRANCKE FLEXIBLE COUPLINGS

Simply two flanges, of cast iron or steel, connected by a series of flexible laminated steel pin units instead of by rigid bolts, giving three-direction flexibility.

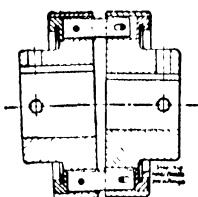


**"FRANCKE" HEAVY PATTERN TYPE FLEXIBLE COUPLING**

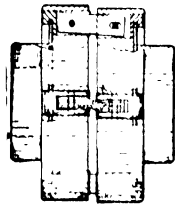


**DETAIL OF FLEXIBLE PIN UNIT**

Each flexible pin unit is extensible, can pivot on the keeper cross pins and, being laminated, can bend between the keeper supports. As the individual pin units are flexible in three directions, so each coupling when assembled is also flexible in three directions.



When the shafts are out of line, the pin springs slide in the keepers, allowing each shaft to run on its own center.



When the shafts are off center, part of the flexible pins pivot about the cross pins (as shown at top and bottom). In a few of the other pin units a slight bend of the springs allows for the misalignment.

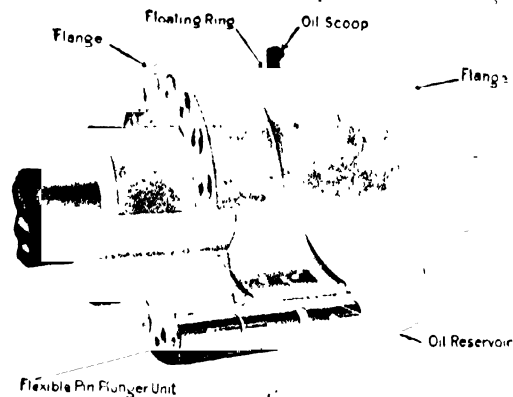
**DETAILS OF CONSTRUCTION AND MOVEMENT**

Francke Flexible Couplings provide against excessive bearing friction due to the usual errors in setting up and the usual misalignment of operation. They also provide a cushion for the driving shocks, reduce vibration, and so make possible the successful operation of direct-connected machines.

**Uses**—The Heavy Pattern type is generally used for connecting the shaft of a prime mover to the shaft of a driven machine where there are two bearings on each shaft—four bearings in a row.

## DOUBLE, FLOATING RING TYPE FRANCKE FLEXIBLE COUPLINGS

This consists of two fixed flanges (one on each shaft) between which is interposed a floating ring.



**"FRANCKE" DOUBLE, FLOATING RING TYPE FLEXIBLE COUPLING**

which is connected to both flanges by a series of flexible steel pin plunger units. These pins support or "float" the ring. When the shafts are off center, the floating ring tilts in the direction of the misalignment, providing exceptional ability to take care of misalignment.

**Uses**—The Double Coupling is intended primarily for large power, comparatively slow speed, and heavy shocks, with excessive misalignment to be anticipated.

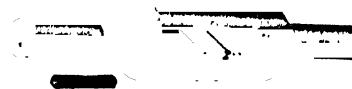
## QUOTATION AND ORDER DATA

On all inquiries and orders for Francke Flexible Couplings, the following essential data should be supplied:

- 1—Number required
- 2—Horse power (normal and maximum)
- 3—Revolutions per minute
- 4—Diameter of both bores
- 5—Size of both keyways
- 6—Kinds of machines connected (both driver and driven)

## PINTITE RIGID COUPLINGS

The cast iron sleeve is bored for a sliding fit on the shafts. The pin holes are drilled in pairs at an angle. Each pin has a hardened cupped cutting end. With the sleeve in place on the shafts, the pins are driven home with a hammer, cutting their own cross keyways in the shafts. The act of driving the pins gives a "keyed and wedged" grip locking both shafts and pins in place.



**PINTITE RIGID LINE SHAFT COUPLING**

Pintite Couplings are carried in stock by many mill supply houses in standard line shaft sizes. They can also be furnished for any shaft size and in reduction patterns.

## CATALOG

Separate bulletins describing various types of couplings for specific purposes will be sent on request stating the service conditions to be met.



# SNYDERFIBA CORPORATION

Lessors of Patent Paper Drum and Barrel Making Machines

15 CLINTON STREET, NEWARK, N. J.

## PRODUCTS

Machines for the manufacture, at your own plant, of Snyderfiba Patent Paper Barrels and Drums.

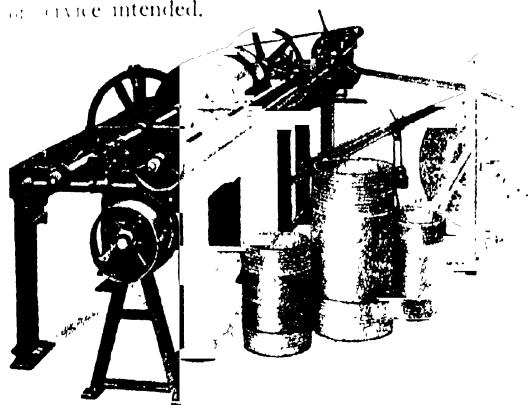
### SNYDER PAPER BARREL MAKING MACHINE

This machine makes drums and barrels from 10" to 30" in diameter and any length to 32".

A mandrel, of whatever size desired, is furnished with the machine, others may be purchased from us at cost.

Standard diameters are: 10½", 12", 14", 15", 16", 17½", 19½", and 20".

Packages can be made heavy or light— to suit load or service intended.



PAPER DRUM AND BARREL MAKING MACHINE

5 H.P. required with simple overhead double clutch and brake arrangement. Actual floor space occupied by machine—9' x 19'.

The strength is determined by width of paper used; by the number of laminations, and by the pitch at which the spiral is wound.

The operation of the machine does not require a skilled mechanic.

The production of the machine is 350 to 500 packages per day, depending on the size.

## BARREL HEADINGS

The packages can be headed with either a regular wooden head with inside and outside steel hoop arrangement, or with a solid crimped on steel head. When using pressed steel heads two men will operate the machine and put one end in the barrels. If other heading is used four men will be needed for maximum production.

## ADVANTAGES

Snyderfiba packages are clean, always the same cubic capacity and weight, they require no inside paper bag lining, and are accepted by the Interstate Commerce Commission for shipment of Insecticides without a paper lining, they are sift proof, there is no shrinkage and in consequence do not need recoopering when your products are stored in them, in your warehouse. Your storage space for cooperage can be greatly reduced, as your raw materials consist of chip board paper, in rolls, silicate of soda, which is the adhesive; and heading.

If you are now making your own wooden cooperage, your insurance risk will be very much less, and your investment in cooperage accordingly smaller.

## FIBER CONTAINERS SUPPLIED BY OUR MANUFACTURERS

The function of this Corporation is merely the leasing of machines on which these containers can be made, and to a manufacturer whose requirements are not in excess of a hundred barrels per day, we will be very glad indeed to recommend our various commercial manufacturers in different parts of the country, who will be pleased to quote.

## OUR CONTAINERS ARE SUCCESSFULLY USED FOR SHIPPING

Insecticides	Dry Tanning Extracts
Dry Colors	Coffee and Spices
Aniline Dyes	Chemicals
Drugs	Stoneware valves and fittings
Food Products	Dried Fruits
Glassware	



GROUP OF SNYDERFIBA CONTAINERS

# SOWERS MANUFACTURING COMPANY

## Dopp Seamless Apparatus

1299 NIAGARA STREET, BUFFALO, N. Y.

### PRODUCTS

"Dopp" Cast Iron Seamless Jacketed Apparatus, consisting of Steam and Oil Jacketed Kettles, Mixers, Vacuum Pans, Pressure Pans, Autoclaves, etc. "Dopp" Seamless Jacketed Soap Crutchers. Single Shell Kettles with or without agitators. Apparatus of Special Design.

### USES

Partial List of Industries Using Dopp Equipment.

Artificial Leather	Laboratories
Artificial Silk	Lacrice
Batteries	Linoleum
Belt Dressing	Margarine
Canning	Matches
Carbon Paper	Meat Extracts
Celluloid Products	Oils and Lubricants
Cements	Ointments and Salves
Chemicals	Optical Goods
Chocolate	Packing Houses
Cleaning Compounds	Paper, Coated
Cocoa	Pencils and Crayons
Cold Creams	Phosphorus and Sulphur
Drugs	Polishing Compounds
Dyestuffs	Polish, Shoe, Stove, etc
Explosives	Rubber Cements
Food Products	Sand Paper
Glass Manufacturers	Salt
Glues and Pastes	Soaps
Graphite	Textile
Grinding Wheels	Tobacco
Gum, Chewing	Tooth Paste
Ink	Varnish
Insecticides	Wall Board
Insulated Products	Wax

### ADVANTAGES OF SEAMLESS, ONE-PIECE, LEAKLESS KETTLES

Completely illustrated and described in Catalog No. 6.

**Cast in one piece**—Kettle, jacket, staybolts (outlet also when specified), are all in one piece; not put together, but cast complete, all at one time from one ladle of iron.

**Thin shells** insure quick heating.

**Unusual Strength**—Dopp Seamless jacketed apparatus is of unusual strength, due to the staybolts being cast right in the kettle. They not only reinforce the shell, but facilitate the

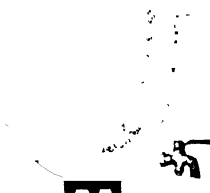
circulation of the steam in the jacket, and hasten the transmission of the heat to the contents.

**Smooth castings**—Dopp Seamless Kettles are cast by a special process in which the iron does not come in contact with sand at all. This produces an absolutely smooth surface without the necessity of grinding the inner surface, which operation destroys the wearing qualities of a kettle.

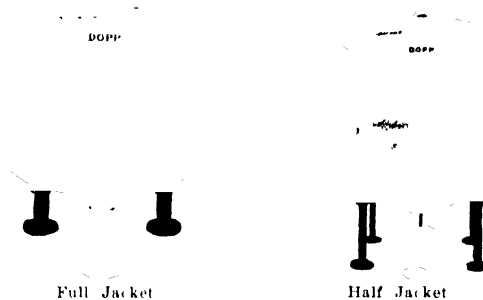
**Long lasting**, because of the simplest possible construction. No bolts or rivets to work loose from contraction and expansion of the metal. Dopp Kettles never leak, last indefinitely and give constant satisfaction.

**Safety** is an important factor in steam jacketed equipment. The absolute safety of Dopp Seamless Kettles lies in their design, the method of manufacture and the 35,000 pounds tensile strength iron used. Every Standard Kettle is tested to 150 pounds hydrostatic pressure. Special kettles built for higher pressures.

**Guarantee**—Covers all defects due to workmanship or material and is not for one year or for five years but for life



DOPP KETTLE WITH BRASS FAUCET



FLAT BOTTOM TYPES



350 GALLON RECTANGULAR TYPE

Inside dimensions 8' long, 3'6" wide, 2' deep Jacket comes within 7 1/2" of top Has 1 1/2" flange around top

### GENERAL

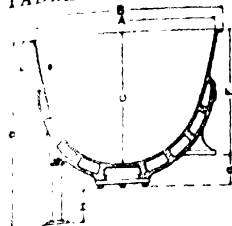
**Sizes**—All standard sizes with principal dimensions are listed in table on opposite page. However, we can build modifications of any of these shapes and sizes when requirements necessitate it.

**Legs**—Table under column headed "H," gives clearance between bottom of kettle and floor for all kettles with which standard legs are included in price. Special legs giving any desired clearance can be furnished at extra cost for these as well as all other sizes.

**Outlet for contents**—These can be furnished in either the screwed in or cast through type, and in whatever size and style necessary to suit product.

*Continued on Next Page*

TABLE OF SIZES



DIMENSION DIAGRAM FOR USE WITH FOLLOWING TABLE

TYPE	A	B	C	D	E	F	G	H	I
1 Std. Flat Bottom	75"	83"	67"	101"				11 1/2"	3
2 Std. Round Bottom	121"	151"	84"	193"	48"			7 1/2"	1.7
3 Spec. Full Jacket	11"	19"	14 1/2"	29 1/2"	1"			12"	3.66
4 Spec. Full Jacket	11"	19"	13"	28 1/2"	1"			12"	3.81
13 Std. Round Bottom	183"	213"	131"	251"	94"			7 1/2"	1.7
14 Std. Flat Bottom	167"	201"	117"	223"				7"	1.5
15 Std. Round Bottom	18"	21 1/2"	20"	32 1/2"	14 1/2"			7 1/2"	1.7
16 Spec. Flat Bottom	18"	26 1/2"	16"	28 1/2"	1"			8"	8.0
17 Spec. Full Jacket	30"	31 1/2"	12 1/2"	22"	47"			5 1/2"	4.95
18 Std. Round Bottom	40"	35"	17"	27"	67"			6"	6.15
19 " " " " Hotel	31 1/2"	36 1/2"	19 1/2"	28 1/2"	71 1/2"			5"	7.6
20 " " " " Hotel	26"	30"	23 1/2"	40"	14 1/2"			12 1/2" (P)	5.07
21 " " " " Hotel	32 1/2"	37 1/2"	22 1/2"	32 1/2"	9"			5 1/2"	8.4
22 " " " " Hotel	29"	33"	26"	40"	16"			10"	6.25
23 " " " " Hotel	39 1/2"	43 1/2"	18 1/2"	31"	84"			9 1/2"	9.3
24 " " " " Hotel	40 1/2"	45"	23 1/2"	34 1/2"	14 1/2"			6 1/2"	8.72
25 " " " " Hotel	47 1/2"	51 1/2"	26"	40"	13"			10"	11.1
26 " " " " Hotel	41 1/2"	46 1/2"	25 1/2"	36 1/2"	10 1/2"			6 1/2"	12.7
27 " " " " Hotel	47 1/2"	51 1/2"	26"	40"	13"			9 1/2" (P)	12.7
28 " " " " Hotel	47 1/2"	51 1/2"	26"	40"	13"			6 1/2"	14.7
125 " " High Jacket Bottom	41 1/2"	46 1/2"	25 1/2"		8"	22 1/2"	12"		19.6
126 " " Full Jacket	41 1/2"	50 1/2"	28 1/2"		1"	22 1/2"	12"		26.1
127 " " Flat Bottom	37 1/2"	45 1/2"	28"		1"			(P)	29.5
128 " " Full Jacket	37 1/2"	45 1/2"	28"		1"				
129 1000 lb. Crutcher Kettle	28 1/2"	31"	11"	36"	26 1/2"	30"	11"		8.1
130 Std. Round Bottom	17 1/2"	53 1/2"	30 1/2"		12"	25 1/2"	9 1/4"		16.4
131 Spec. Round Bottom	41 1/2"	47"	33"		14"	26"	13 1/4"		10.6
132 Spec. Round Bottom	41 1/2"	47"	33"		5"	26"	13 1/4"		26.1
133 Std. Round Bottom	51 1/2"	59 1/2"	27 1/2"		9"	25 1/2"	7 1/2"		21.2
134 1500 lb. Crutcher Kettle	41 1/2"	47"	33"		26 1/2"	30"	15"		11.2
135 Std. Round Bottom	53 1/2"	59 1/2"	29 1/2"		9"	25 1/2"	12"		24.1
136 Spec. Round Bottom	40 1/2"	46"	40 1/2"		21"			(P)	25.8
137 Spec. Round Bottom	45"	54 1/4"	40 1/2"		1"	23"	24 1/4"		31.7
138 1800 lb. Crutcher Kettle	41 1/2"	47"	46"		33"	30"	21 1/4"		11.2
139 Std. Round Bottom	60"	65 1/2"	31"		10 1/2"	22"	11"		34.6
140 Spec. Round Bottom	62 1/2"	68"	34 1/2"		12"	25 1/2"	11 1/4"		34.1
141 Spec. Round Bottom	47 1/2"	53 1/4"	53 1/2"		8"	36"	24 1/2"		38.3
142 Std. Round Bottom	47 1/2"	53 1/4"	53 1/2"		1"	36"	24 1/2"		45.3
143 2000 lb. Crutcher Kettle	51 1/2"	57"	40 1/2"		26 1/2"	30"	25"		27.0
144 Std. Round Bottom	62 1/2"	68"	34 1/2"		12 1/2"	25 1/2"	14"		31.8
145 3000 lb. Crutcher Kettle	67 1/2"	72 1/2"	43 1/2"		17 1/2"	35"	13 1/2"		37.6
146 4000 lb. Crutcher Kettle	51 1/2"	57"	50 1/2"		39 1/2"	40"	25"		27.0
147 Std. Round Bottom	66 1/2"	73 1/4"	51 1/4"		23 1/2"	33 1/2"	23 1/4"		43.0
148 Spec. Round Bottom	66 1/2"	73 1/4"	51 1/4"		15"	33 1/2"	23 1/4"		55.0
149 Spec. Round Bottom	66 1/2"	73 1/4"	51 1/4"		1"	33 1/2"	23 1/4"		76.4
150 1500 lb. Crutcher Kettle	51 1/2"	57"	40 1/2"		49 1/2"	50"	25"		27.0
151 Std. Round Bottom	68"	74 1/2"	61"		33 1/2"	43 1/2"	24 1/2"		43.0
152 Spec. Round Bottom	68"	74 1/2"	61"		24 1/4"	43 1/2"	23 1/2"		55.0
153 Spec. Round Bottom	68"	74 1/2"	61"		11"	43 1/2"	23 1/2"		76.4
154 Extra High Jacket	68"	74 1/2"	61"		1"	43 1/2"	23 1/2"		90.7
155 Spec. Round Bottom	60"	66 1/2"	68"		17"	30"	44"		62.2
156 Std. Round Bottom	69 1/4"	75 1/4"	71"		13 1/2"	53 1/2"	23 1/2"		43.0
157 Spec. Round Bottom	69 1/4"	75 1/4"	71"		34 1/4"	53 1/2"	23 1/2"		55.0
158 High Jacket	69 1/4"	75 1/4"	71"		21"	53 1/2"	23 1/2"		76.4
159 Spec. Round Bottom	69 1/4"	75 1/4"	71"		11"	53 1/2"	23 1/2"		190.7

## SINGLE SHELL APPARATUS

While we specialize in jacketed apparatus, any of the above kettles can be furnished without the jacket. These single shell kettles can be equipped with any of our various styles of agitators.



STYLE "A" BRACKET TYPE

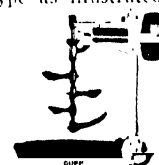
## AGITATORS

**Style "A" Bracket Type Agitator**—For rapid and thorough mixing of semi-fluid substances. Agitator consists of a series of propeller blades so fitted together as to form a continuous screw. This screw forms a conveyor which draws the material from the bottom of the kettle up through and over the drum. The material in contact with the jacketed surface is therefore constantly changed.

Sizes: 20 to 100 gallons in Bracket Type as illustrated 20 to 800 gallons in bridge type drive

**Style "B" Bracket Type Agitator**—Built with either bracket or bridge type drive in all sizes from 20 to 100 gallon inclusive. All larger sizes, bridge type drive only.

This mixer is well adapted for use with all substances where it is desired to assist evaporation, or where a simple agitation of the materials will prevent their sticking to the sides of the kettle



STYLE "B" BRACKET TYPE

## Style "B" Bridge Type Agitator

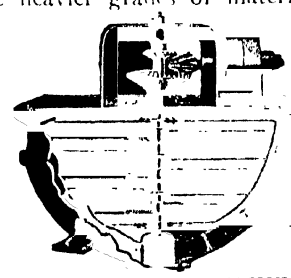
—This combination of kettle fitted with steel belt was designed to handle materials where but a relatively small jacketed surface is required. The kettle proper is of our seamless construction, thus doing away with all chance of leaks. Any of our kettles or agitators can be fitted with these steel belts.

## Style "D" Bridge Type Agitator

—Designed for thorough agitation of the heavier grades of materi-

STYLE "B" WITH STEEL BELT

als. The outside sweep with its cross paddles revolves in one direction, while the smaller paddles revolve in the opposite direction at twice the speed. Adjustable steel scrapers are attached to the sweep, scraping the interior surface of the kettle.



Sizes: 20 to 800 gallons in **STYLE "D" DOUBLE MOTION** bridge type as illustrated. Also built with bracket type drive, sizes 20 to 100 gallons inclusive.

**Style "A-D" Agitator**—Develops a most thorough agitation as two radically different motions are obtained. The spiral screw lifts the contents to the top of the mixer while the sweep with paddles attached works through the mass in the opposite direction forcing it downward so that it is again caught by the screw. The outside sweep is provided with adjustable steel scrapers which scrape the interior surface of the kettle. Made in all sizes from 20 gallons up.

STYLE "A-D" DOUBLE MOTION

Continued on Next Page



ROUND BOTTOM FULL JACKET KETTLE WITH "D" AND "AD" MIXERS

Both mixers as illustrated are built entirely of cast iron

**Style "I" Agitator**—This mixer exerts a plow-like action on contents of kettle. Paddles are staggered so that those on one side strike the material which passes between the paddles on the other side.

**Covers**—As shown by this illustration and one immediately above, all Dopp Kettles may be equipped with covers for either vacuum or pressure.



STYLE "I" WITH COVER

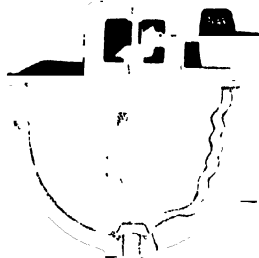


STYLE "J"

forces the contents up through the drum where the swirl is broken by means of stationary vanes. Clearance between bottom of drum and kettle is adjustable. This agitator is particularly adapted for the rapid and thorough mixing of light liquids such as emulsions.

**Style "J" Agitator**—Made in all sizes from 20 gallons up. Sweep built same as sweep part of "D" mixer. Used where simple agitation only is required but where it is necessary to keep contents scraped from jacketed surface to prevent sticking and burning.

**Style "K" Propeller Screw Agitator**—The propeller



STYLE "K"

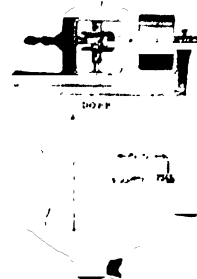
**Style "L" Ribbon Type Agitator**—The ribbon follows the contour of the kettle to whatever height desired, the action being to raise the contents and dump toward the center of the kettle. It is very efficient in mixing granular or crystalline substances as well as the mixing of such materials with liquids.

Sizes: 20 to 800 Gallons capacity

#### OIL JACKETED APPARATUS

The seamless feature, obviating oil leaks—the thin, yet safe walls, and the staybolt construction, which materially assists circulation, make the Dopp kettle most efficient for use in connection with oil heating systems. Temperatures up to 550°F. can be reached and maintained inside the kettle. Details furnished upon request.

#### "DOPP" SOAP CRUTCHERS



"A" BELT DRIVEN



"B" ENGINE DRIVEN

(All Dimensions in Inches)

Capacity, Lbs.		Diam. at Top	Depth Inside	Height			T & L Pulleys (With Style "A" only)	Lug to Flange
Rated	Total			Over All				
				A	B			
1000	1200	38	36	65	77	30	14 x 4	
1500	1700	42	40	69	81	30	14 x 4	48 x 4
1800	2040	42	46	75	87	30	14 x 4	60 x 4
2000	3100	52	49	79	89	30	20 x 5	72 x 4
3000	4000	52	59	89	99	40	20 x 5	72 x 4
4500	5000	52	69	99	109	50	20 x 5	72 x 4

We illustrate above our improved types of crutchers which are used extensively in the soap making industry. Kettles are of **seamless** construction, as described on page 840. This eliminates all possibility of leaks and as the inside of the kettle is perfectly smooth, it can be quickly and easily cleaned after each operation. Agitator is of the conveyor screw type surrounded by pipe radiator or jacketed drum. Style "A" is provided with tight and loose pulleys, as illustrated. Style "B" is provided with an 8-horsepower engine, making it ideal for either small plants where engine can be used to drive other machinery or large plants where it is easier to run piping than shafting.

#### QUOTATION INFORMATION

In order to save time in making quotations, we suggest that in writing us for prices you give particular attention to the following:

- 1—What is the maximum steam pressure you will use?
- 2—If kettle is to be equipped with cover, what will be the maximum internal pressure.
- 3—What size and style outlet do you desire in bottom of kettle for contents?
- 4—Should this outlet be in center of kettle or to one side of bottom?
- 5—If kettle is to be equipped with legs for support, what clearance is desired between kettle or outlet (if required) and floor?
- 6—What is the consistency of the material to be handled? (Water, oil, molasses, tar, etc.)

**ADOPT THE DOPP**

*Continued on Next Page*

**DOPP VACUUM PANS**

Basis of these pans is the Dopp Seamless Steam Kettle used for the lower half. The dome is practically the same shape as the kettle, makes a symmetrical and well proportioned piece of apparatus. These pans are cast by the same special process (fully described on page 840) which has made the Kettles so famous for their smoothness and strength. This, combined with their leakless feature, makes them particularly well adapted for use where cleanliness and absolute dryness are essential. Are widely used in making beef extract, prepared foods and many kinds of chemical products.

Capacity given is that which entire pan will hold which should be particularly noted when figuring capacities wanted. They are listed in this way on account of the different actions of the various materials produced in them. Some, for example, do not foam and pan can be at least two-thirds filled. Others foam violently and pan cannot be over half full. On this account it would not be possible to list these in working capacities.

**Standard Sizes**—10, 40, 60, 100, 200, 300, 350, 400, 500, 600, 700, 800, 1000, 1300 and 1600 gallons. The kettles making up the bottom halves of these sizes are the standard kettles of one-half the above capacities, dimensions of which are given in table on page 841.

**Standard Pans** are equipped with man-hole, two peep-holes, vapor outlet and bosses tapped for thermometer, vacuum gauge and vacuum breaker. All other attachments, such as thermometer, vacuum gauge, save-all, condenser, pump, etc., furnished only when specified.

**Manholes**—Standard sizes furnished as follows: 10 gallon, 4" hand hole; 40, 60 and 100 gallon, 9" x 12"; 200, 300 and 350 gallon, 12" x 15"; 400 gallon and all larger sizes, 14" x 18".

**Peep-holes**—Standard sizes furnished as follows: 10 gallon, 2"; 40 and 60 gallon, 4"; 100, 160 and 200 gallon, 5"; all larger sizes, 6".

**Vapor Outlet**—On standard pans, unless otherwise specified, is placed in center top of dome and fitted with companion flange of the following sizes: 10 gallon, 2"; 40 and 60 gallon, 2½"; 100 and 160 gallon, 3"; 200 and 300 gallon, 4"; 350 and 400 gallon, 5"; 500 gallon, 6"; 600 gallon, 7"; 700 gallon, 8"; 800 gallon, 9"; 1000 gallon, 10"; 1300 and 1600 gallon, 12".

**Outlet for Contents**—These can be furnished in either the screwed in or cast through type, and in whatever size or style necessary to suit product.

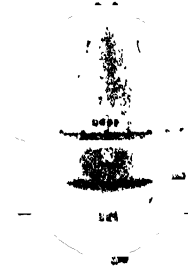
**Legs**—On sizes up to 100 gallons inclusive (see illustration top of next column) are those furnished with the standard kettles which are used to make up these sizes as listed on page 841. Special legs for these sizes as well as legs for all larger sizes can be supplied when desired.

**Mixers**—These vacuum pans can be equipped with any of the various styles of agitators made by us, a few of which are illustrated and described on the preceding pages.

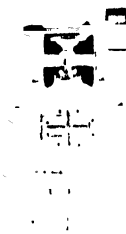
**Save-all, Condenser and Pump**—When this equipment is desired we will gladly furnish estimates upon receipt of complete data covering customers' requirements.

**STANDARD DOPP VACUUM PANS**

ALL SIZES UP TO AND INCLUDING 100 GAL



ALL SIZES OVER 100 GAL



VACUUM PAN WITH SINGLE MOTION AGITATOR



10-GAL. LABORATORY PAN

**Standard Pan with Drive for Any Type of Single Motion Agitator**—

For view of opposite side, showing vapor outlet, see illustration below.

For detailed information as to standard sizes, etc., see preceding column.



**Standard Pan with Drive for Any Type of Double Motion Agitator**—

For view of opposite side showing manhole, thermometer, vacuum gauge and vacuum breaker bosses, see illustration above. For detailed information as to standard sizes, etc., see preceding column.

VACUUM PAN WITH DOUBLE MOTION AGITATOR

This pan is very popular for use in connection with experimental work. While having only ten gallons total capacity, it embodies all of the features of our larger equipment and therefore results obtained in this unit can be duplicated later on a manufacturing basis in our larger units.



COMP



VACUUM PAN WITH "K" AGITATOR



VACUUM PAN WITH "J" AGITATOR

**Standard Pan with Style "K" Propeller Screw Agitator**—This is the same type of agitator as described on page 842. Is built as illustrated, either for heating and mixing under vacuum or where the nature of the materials makes it necessary to have considerable space above the level of the contents.

**Special 1300 gallon Pan**—Bottom half of this pan is standard 650 gallon full jacketed kettle. As the work for which this pan was designed required, at times, additional heating and cooling surface, it is fitted with two pipe coils, each working independent of the other and both independent from jacket. By this arrangement temperatures are very easily controlled. Can be furnished in any size desired.

# D. R. SPERRY & CO.

## Builders of Filter Presses

BATAVIA, ILL.

(Near Chicago)

REPRESENTATIVES

NEW YORK  
H. E. Jacoby, 95 Liberty St.

SAN FRANCISCO  
B. M. Pilhashy, 932 Merchants Exchange Building

### PRODUCTS

**Filter Presses**—The Sperry Filter Press. Made in 8 different sizes and of various materials.

**Vacuum Pans**—The Sperry Swing Kettle Vacuum Pan, also cylindrical cast iron vacuum pans up to 60" external diameter.

### FILTER PRESSES

**Manufacturing Facilities**—The Sperry Filter Press is made entirely in our own plant. This insures proper inspection and prompt shipments.

**Sizes**—10", 12", 18", 24", 30", 32", 36", 42". Such a range of sizes will take care of all filtration problems encountered in the industries.

**What Made Of**—The Sperry filter press can be made of the following materials—

- Cast iron
- Cast iron galvanized.
- Cast iron enameled.
- Bronze.
- Lead
- Aluminum.
- Semi-steel

Wood, maple, cypress, yellow pine, ash treated with paraffine

There is a proper material for every substance filtered. We are always glad to furnish recommendations.

**Closing devices**—We ordinarily furnish the Sperry quick opening and closing device by means of which a press can be opened by one or two revolutions of the capstan. We are prepared to furnish gear closing devices or ratchet closing devices as desired.

**Arrangements**—We can supply 22 different arrangements each one of which requires a certain kind of plate. For the material which you filter there is a certain arrangement which is suitable. We are able to advise fully on this.

**Plate surfaces**—Our standard plate surface is our radial grooved type. This combines long cloth life with direct flow of filtrate to outlet. We can furnish parallel grooved or pyramid surface if desired.

### WHAT A FILTER PRESS CAN DO

A filter press separates solids from liquids. It eliminates the necessity of waiting for solids in liquids to settle. It accomplishes in a few hours that which would require weeks by process of settling.

Solids are delivered in cake form and clear portion or filtrate can be piped away to suitable container.

Before removing the solids from a filter press they can first be washed or lixiviated to remove some desired material held in the cake.

### EXPERIMENTAL LABORATORY

We have a laboratory in which experiments are carried on to determine filtering rates. Our broad experience, however, enables us to figure on your requirements quite closely even without experimental data.

### SPERRY HOLLOW PLATES

The Sperry hollow filter plates permit the filtration of substances at higher temperatures by means of allowing steam to enter the interior of each plate. It, however, is desired to filter at low temperatures a refrigerating medium such as brine can be caused to circulate through the hollow interiors of the plates.

### FILTER CLOTHS

There are hundreds of different weaves of filter cloth, and many different materials from which filter cloths can be made. We are glad to recommend the proper kind of cloth for your particular problem.

We have a filter cloth department and can supply sewed cloths or filter cloth in rolls.

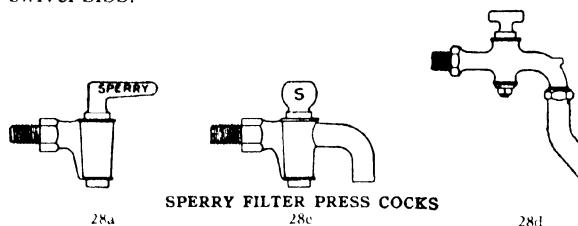
### FILTER PRESS COCKS

Sperry filter press cocks are especially designed for filtration work and made in our own plant.

The No. 28a cock is full opening, allowing complete and rapid draining of the plate.

The No. 28c cock has two outlets, one from the bibb, and the other from the plug. This is used in combination with a double gutter, one outlet for clear liquor, the other for cloudy runnings. Each outlet discharges into its appropriate side of the double gutter.

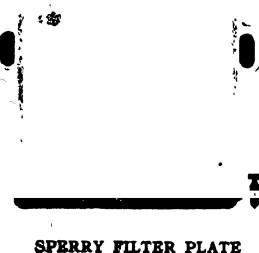
No. 28d accomplishes the same result except that diversion of flow from the cock is made by means of a swivel bibb.



### SPERRY FILTER PLATE

We always furnish the Sperry Radial Grooved Surface as shown below unless otherwise specified. This surface combines a large bearing for the cloth, with direct flow of filtrate to the outlet. This means longer lived cloths and more efficient filtration.

Other plate surfaces can be supplied when wanted. Sperry Filter Plates are made very heavy and will stand hard usage.



*Continued on Next Page*

**LABORATORY FILTER PRESS**

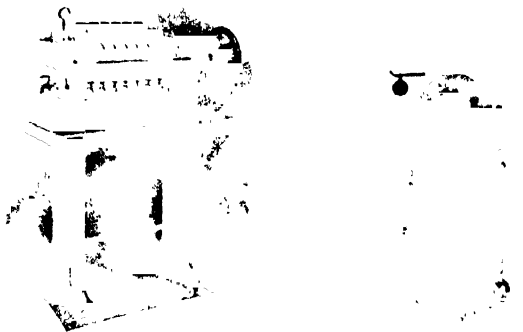
This apparatus is so constructed as to be convertible into any of the various commercial arrangements used in filter presses. It is an invaluable laboratory adjunct as the desired arrangement for the filtration of a given substance can be determined. It is furnished in iron, wood, brass or lead.

The outside dimensions of the plates are such that each plate has a total filtering area of 1 sq. ft. There are five plates in the press giving a total filtering area of 5 sq. ft.

The different washing systems can be used with this filter press.

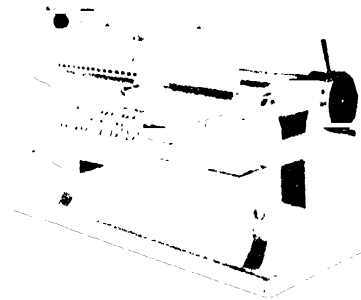
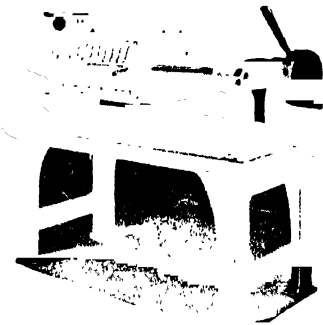
Weight about 850 lbs.

The Montejus or feeding device shown at the right can be employed to fill press by air pressure or a small pump can be used.

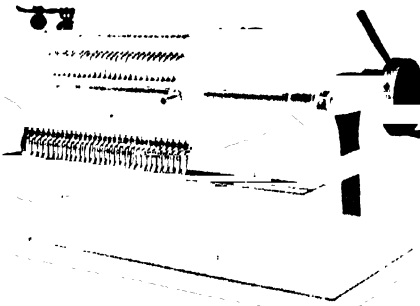
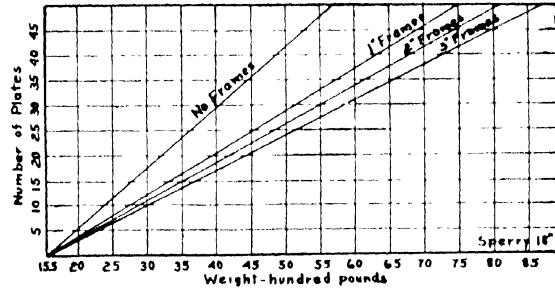


LABORATORY FILTER PRESS

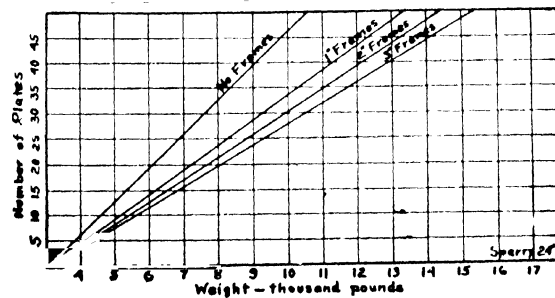
MONTEJUS

**18" SPERRY FILTER PRESS DATA**

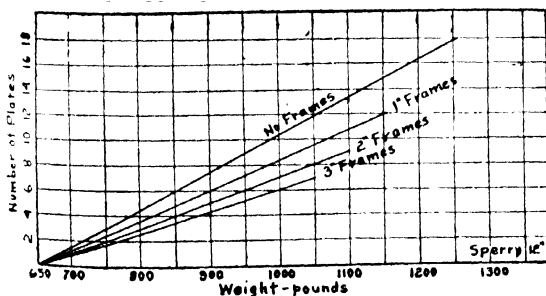
Number of Plates	Filtering Area Sq. Ft.	Volumetric Capacity, Cubic Feet				
		Thickness of Frames, Inches				
		1 1/4" or recessed	1 1/2"	1 3/4"	2"	3"
15	55.0	2.87	3.44	4.01	4.58	5.73
20	72.5	3.78	4.54	5.31	6.05	7.56
25	89.6	4.68	5.62	6.55	7.5	9.36
30	107	5.69	6.8	7.81	8.93	11.16
35	124	6.49	7.78	9.07	10.36	12.95
40	141	7.15	8.85	10.1	11.8	14.7
45	158.5	8.1	9.95	11.6	13.25	16.6
50	176	9.21	11.0	12.9	14.7	18.4

**24" SPERRY FILTER PRESS DATA**

Number of Plates	Filtering Area Sq. Ft.	Volumetric Capacity, Cubic Feet				
		Thickness of Frames, Inches				
		1 1/4" or recessed	1 1/2"	1 3/4"	2"	3"
15	103	5.35	6.44	7.5	8.57	10.7
20	135	7.04	8.45	9.85	11.25	14.06
25	168	8.7	10.45	12.2	13.94	17.4
30	199	10.39	12.46	14.52	16.6	20.75
35	231.5	12.05	14.49	16.88	19.3	24.1
40	264	13.75	16.5	19.25	22.0	27.5
45	296	15.4	18.5	21.6	24.7	30.8
50	328	17.1	20.5	23.9	27.4	34.2

**12" SPERRY FILTER PRESS DATA**

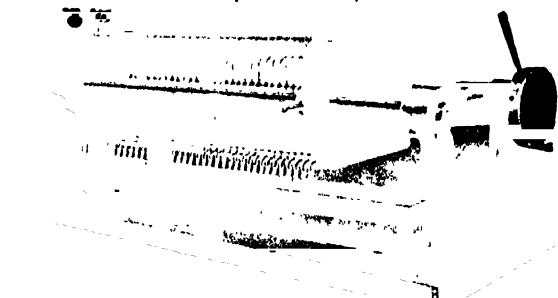
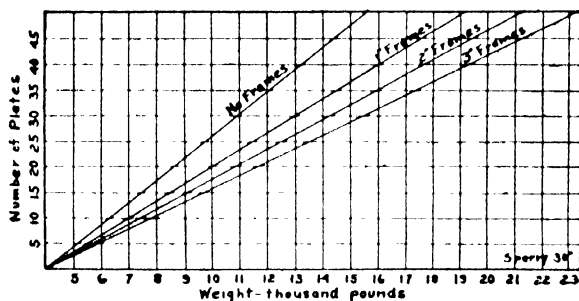
Number of Plates	Filtering Area Sq. Ft.	Volumetric Capacity, Cubic Feet				
		Thickness of Frames, Inches				
		1 1/4" or recessed	1 1/2"	1 3/4"	2"	3"
15	24.5	1.28	1.53	1.79	2.05	2.56
20	32.2	1.68	2.02	2.46	2.69	3.31
25	39.9	2.08	2.5	2.91	3.33	4.16
30	47.6	2.48	2.98	3.48	3.97	4.96
35	55.2	2.88	3.45	4.02	4.6	5.76
40	62.8	3.27	3.93	4.58	5.24	6.55
45	70.5	3.68	4.4	5.14	5.88	7.36
50	78.1	4.01	4.89	5.68	6.52	8.14



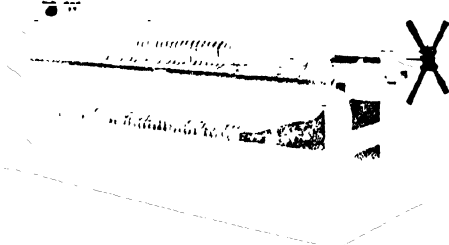
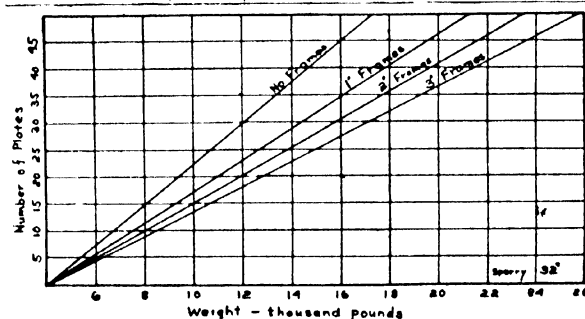
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**30" SPERRY FILTER PRESS DATA**

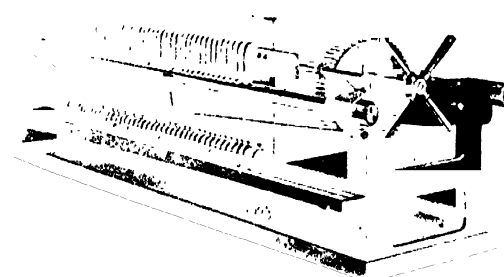
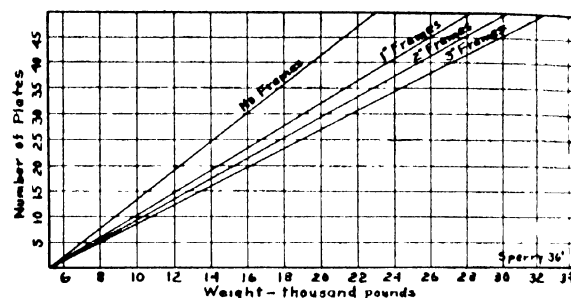
Number of Plates	Filtering Area Sq. Ft.	Volumetric Capacity, Cubic Feet					
		Thickness of Frames, Inches					
		1 1/4" or recessed	1 1/4"	1 3/4"	2"	2 1/2"	3"
15	168.1	8.76	10.5	12.25	14.0	17.55	21.06
20	221	11.52	13.8	16.1	18.4	23.00	27.64
25	273	14.25	17.1	19.95	22.8	28.5	34.2
30	326	17.00	20.4	23.8	27.2	34.0	40.8
35	379	19.75	23.6	27.6	31.6	39.5	47.4
40	431	22.47	26.9	31.4	36.0	45.0	53.85
45	484	25.2	30.2	35.2	40.5	50.5	60.4
50	536	27.9	33.4	39.0	44.8	56.0	67.0

**32" SPERRY FILTER PRESS DATA**

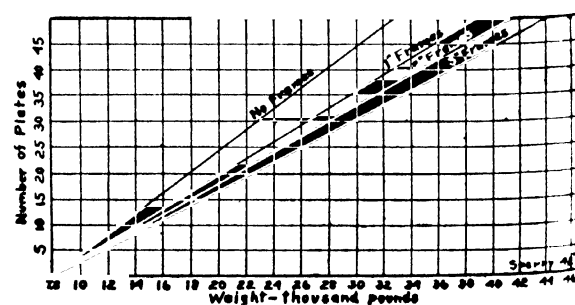
Number of Plates	Filtering Area Sq. Ft.	Volumetric Capacity, Cubic Feet					
		Thickness of Frames, Inches					
		1 1/4" or recessed	1 1/4"	1 3/4"	2"	2 1/2"	3"
15	193	10.0	12.1	14.1	16.1	20.3	24.2
20	254	13.2	15.9	18.5	21.2	26.5	31.8
25	314	16.4	19.6	22.9	26.2	32.6	39.3
30	375	19.5	23.4	27.4	31.2	39.0	46.8
35	435	22.7	27.2	31.7	36.2	45.5	54.3
40	495	25.8	31.0	36.1	41.2	51.5	61.8
45	556	29.0	34.8	40.6	46.4	58.1	69.6
50	616	32.1	38.5	45.0	51.4	64.2	77.1

**36" SPERRY FILTER PRESS DATA**

Number of Plates	Filtering Area Sq. Ft.	Volumetric Capacity, Cubic Feet				
		Thickness of Frames, Inches				
		1 1/4" or recessed	1 1/2"	1 3/4"	2"	2 1/2"
15	251	13.1	15.7	18.3	20.9	26.2
20	330	17.2	20.6	24.0	27.5	34.1
25	408	21.2	25.5	29.8	34.0	42.5
30	486	25.3	30.4	35.4	40.5	50.6
35	565	29.4	35.3	41.2	47.1	59.0
40	643	33.5	40.2	46.9	53.6	67.0
45	721	37.6	45.1	52.1	60.1	75.1
50	800	41.6	50.0	58.0	66.6	83.4

**42" SPERRY FILTER PRESS DATA**

Number of Plates	Filtering Area Sq. Ft.	Volumetric Capacity, Cubic Feet				
		Thickness of Frames, Inches				
		1 1/4" or recessed	1 1/2"	1 3/4"	2"	2 1/2"
15	347	18.05	21.7	25.3	28.9	36.1
20	456	23.7	28.5	33.3	38.0	47.5
25	564	29.4	35.2	41.1	47.0	58.7
30	682	35.5	42.6	49.7	56.8	71.0
35	781	40.7	48.8	57.0	65.1	81.5
40	890	46.4	55.6	65.0	74.2	92.7
45	1000	52.1	62.5	73.0	83.4	104.0
50	1107	57.6	69.2	80.7	92.2	115.0







# SPRAGUE ELECTRIC WORKS

Of General Electric Company

527-531 West 34th Street

NEW YORK, N. Y.



Maspeth, L. I.

FACTORIES  
Bloomfield, N. J.

New Kensington, Pa.

## BRANCH OFFICES

Atlanta, Citizens & Southern Bank Building  
Baltimore, American Building  
Boston, 84 State Street  
Chicago, Fisher Building  
Cincinnati, Provident Bank Building  
Cleveland, Illuminating Building

Indianapolis, Traction Terminal Building  
Kansas City, Dwight Building  
Milwaukee, Public Service Building  
Philadelphia, Witherspoon Building  
Pittsburgh, Oliver Building  
St. Louis, Pierce Building

## PACIFIC COAST REPRESENTATIVES

Los Angeles, Corporation Building  
Portland, Ore., Electric Building

San Francisco, Rialto Building  
Seattle, Colman Building

Spokane, Paulsen Building

## PRODUCTS

The Sprague Electric Works of the General Electric Company manufactures a number of products especially adaptable to the chemical industry, a few of which are enumerated below:

### VENTILATING FANS FOR CHEMICAL PLANTS

These fans are extremely useful in drawing off acid fumes common to Chemical Industry, many of which are positively dangerous to health.

Volts—A. C.—110, 220, 440, 550.

D. C.—115, 230, 550.

Sizes—12½ to 48 inches in diameter.

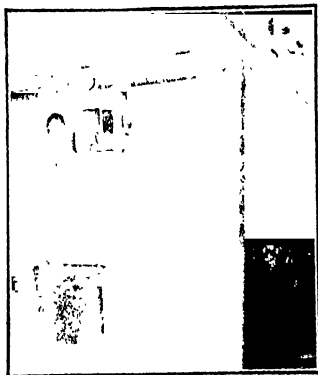
Capacity, 750 to 25,000 cubic feet per minute.



SPRAGUE VENTILATING FAN IN CHEMICAL LABORATORY  
Sprague Ventilating Fans Made This Room Livable

### MATERIALS HANDLING EQUIPMENTS FOR CHEMICAL PLANTS

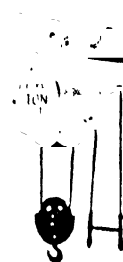
Electric Hoists—  
For handling Ore,  
Coke, Molten Metal,  
Barrels, etc., and suc-  
cessfully operating un-  
der the trying con-  
ditions existing in the  
Chemical Industry.



SPRAGUE HOIST IN METALLURGI-  
CAL ROOM

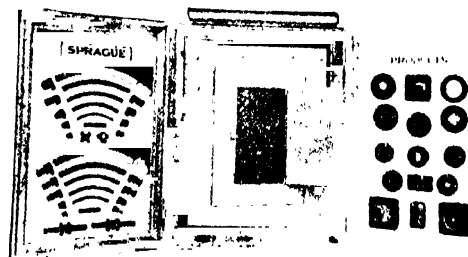
Type I-6 (¼-ton) or S-1 (½-ton) hoisting speed 25 ft. per minute, height of lift 25 ft.

Other sizes up to six tons, also Monorail Cranes, Winches and Winding Drums.



TYPE S-1 HOIST

### WIRING MATERIALS FOR CHEMICAL PLANTS



GENERAL EXHIBIT OF SPRAGUE WIRING MATERIALS

**Flexible Steel Armored Conductors**—"BX" for quick, dependable, fireproof wiring in connecting up machinery, Electric Furnaces and lights. Sizes No. 14 to No. 2. Furnished with Leaded Insulation for damp places. **Flexible Steel Conduit** in Diameters from 5/16" to 2½".

**Rigid Conduit**—(Greenfielduct)—The only Conduit Hot Galvanized inside and out—highly resistive to the elements and conditions prevalent in the Chemical Industries.

Sizes ½", ¾", 1", 1¼", 1½", 2", 2½", 3½", and 4", approximately, inside.

All sizes in 10 ft. lengths.

**Spragueduct**—A Superior Black Enamelled Conduit. Same sizes as Greenfielduct, also 4½", 5" and 6" diameters.

### HOSE FOR VARIOUS USES IN CHEMICAL PLANTS

**Flexible Steel Armored Hose**—Especially adapted for severe usage, assuring longevity through the flexible Steel Armor. Indispensable where air, steam, water, or certain chemical solutions are to be conducted.

Sizes, ¼" to 2", also ½" to 1½", standard 25 and 50 ft. lengths.

# SPROUT, WALDRON & COMPANY

Manufacturers of  
Milling Machinery  
MUNCY, PA.

## PRODUCTS

Roller Mills, Dust Collectors, Suction and Exhaust Fans, Attrition Mills, Burr Mills, Grinders, Crushers, Filling, Weighing and Packing Machinery, Mixing Machinery, Scales, Power Transmission Machinery.

### MONARCH STANDARD BURR MILLS

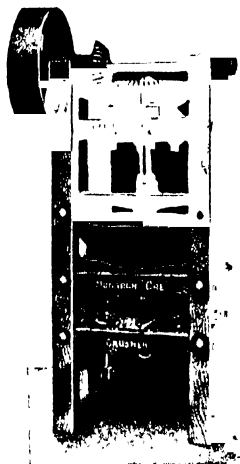
We manufacture a complete line of these efficient and widely used mills. We supply them with any drive desired and for any capacity. They are used for grinding drugs, chemicals, pigments and dry colors.



MONARCH STANDARD BURR MILL

### MONARCH ORE CRUSHER

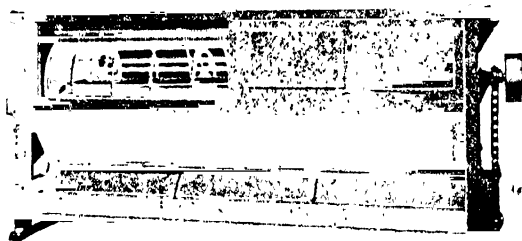
This Crusher is thoroughly built and its parts made strong for the work for which it was designed. It will crush materials of medium hardness, such as bone, oyster shells, shale, pant rock, etc., for finishing on our vertical mills.



MONARCH ORE CRUSHER

### BOLTING MACHINERY

Our line of sifters, reels and bolting machinery is complete. We have a large variety of styles, adaptable to every place a sifter is required. They are constructed of the very best material and workmanship, on the most scientific principles of perfection attained in bolting machinery.

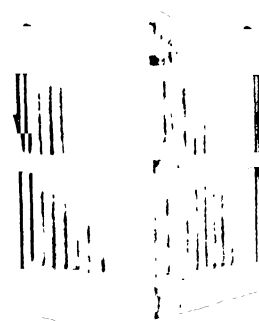


MONARCH CENTRIFUGAL REEL, STYLE "F"

### WILSON TUBULAR DUST COLLECTOR

The efficiency of a Textile Dust Collector is measured by the amount of filtering capacity of the cloth contained and the simplicity of the cleaning device.

The machine is generally attached to the ceiling but may be supported in any other suitable manner, and the general construction is simple. Dust-laden air enters the tubes in a downward course and precipitates to the lower case where a drag discharges it into a cross conveyor.



WILSON TUBULAR DUST COLLECTOR

### MONARCH BALL BEARING ATTRITION MILL

For pulverizing a great variety of materials, from perfectly dry materials to materials that are in suspension with a liquid.

The Monarch Ball Bearing Motor-Driven Attrition Mill embodies all of the points of excellence and superiority found in the ball bearing belt-driven mill and in addition is equipped to make it a perfect modification for the user of electric motive power.



MONARCH BALL BEARING ATTRITION MILL

The motors are the best obtainable, are specially constructed for this service and give the mill the maximum efficiency of which it is capable.

Electrical equipment consists of two Direct Connected 60-Cycle Westinghouse Special Type Induction Motors, one Oil Immersed Type "A" Auto-Starter, of sufficient size to start both motors simultaneously, one Overload Release and one No Voltage Release.

### MONARCH PACKING MACHINES

We manufacture a complete line of packing and filling machines for every possible use. We also build special machines for this class.

### FEEDERS AND MIXERS

A machine for every purpose.

When in need of grinding, crushing, bolting, separating and mixing machinery write to us.

# THE STANDARD CALORIMETER COMPANY

Parr Calorimeters and Apparatus for Fuel Testing—Products of Acid-Resisting Alloy—Illium

EAST MOLINE, ILLINOIS

## PRODUCTS

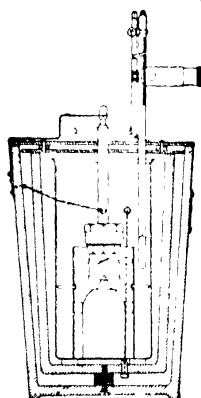
Parr Calorimeters, Illium Castings, Illium Laboratory Ware, etc. Parr Sulphur Bombs, Parr Sulphur Photometer, Parr Total Carbon Apparatus, Needle Valve for Combustion Work, Release Valve for Oxygen Bombs.

## PARR STANDARD CALORIMETER

This well known type of calorimeter, in which sodium peroxide is used as the medium of combustion, is marked advantages over the old pattern bomb as follows:

- 1 Fusion cup removable
- 2 Extra cup supplied allows making of duplicate determinations.
- 3 Fusion cup made of special alloy most resistant of all metals to melted alkali
- 4 Cup comes to red heat, insuring complete combustion

Price—Calorimeter complete with thermometer, \$100.00. Stirrer motor for calorimeter, \$30.00. Peroxide Bomb alone, \$40.00.



PARR STANDARD CALORIMETER

## PARR OXYGEN BOMB CALORIMETER

This calorimeter is equipped with an oxygen bomb of Illium, which for calorimetric purposes is the exact equivalent of platinum. Being turned from solid metal this bomb overcomes the difficulties in the operation of lined bombs and the corrosion in the shell under the lining of even platinum bombs.

This calorimeter is furnished in the plain type with indurated fiber jacket and also with adiabatic jacket.

The adiabatic jacket makes it possible to maintain the temperature of the jacketing water at the same stage as that of the inner system. Thus uncertain and complicated corrections for radiation are avoided. This instrument is adapted to precise work of the most exacting degree of refinement.

Prices—Oxygen Bomb Calorimeter (plain type without thermome-

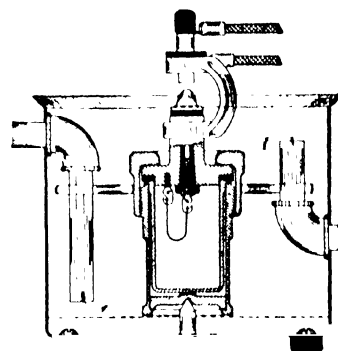
ter), \$300.00. Adiabatic type, without thermometer, \$400.00. Illium Bomb (alone), \$225.00. Thermometer with B. of S. certificate 65°-90°, \$12.00, 65°-105°, \$15.00. Stirrer Motor, \$30.00.

## PARR SULPHUR BOMB

For organic and inorganic sulphur and organic halogens to replace the Carius Method. Particularly recom-

mended for use in fuel testing laboratories, research departments, rubber factories, organic laboratories, food laboratories, analytical laboratories, soil surveys.

By use of the Parr Sulphur Bomb sulphur determinations can be made in the quickest and most accurate manner. The bomb is furnished in three types. Electric ignition with water jacket, \$40.00. Electric ignition without water jacket, \$31.50. Bomb for heat ignition, \$25.00.



SULPHUR BOMB WITH WATER JACKET

## PARR SULPHUR PHOTOMETER

The solution from the Parr Sulphur Bomb or Parr Standard Calorimeter is brought to slight acidity. Aliquot part of solution taken. Barium salt added. Shaken. Photometer now gives direct reading indicating percentage of sulphur in sample. Price, \$40.00.

## PARR TOTAL CARBON APPARATUS

Acid is added to residue from determination of heat values, the carbon dioxide gas is measured by this apparatus and total carbon readily determined. Available hydrogen can also be determined. Price, \$52.00.

## NEEDLE VALVE FOR COMBUSTION WORK

By use of this valve it is possible to count bubbles passing through absorption train. Price, \$5.00.

## RELEASE VALVE FOR OXYGEN BOMBS

Price, \$5.50.

## ILLIUM CASTINGS, LABORATORY WARE, ETC.

Castings of this alloy have a tensile strength of 85,000 lbs. per square inch, melting-point 1280°C., Brinnell test for hardness 170 to 200 at 3000 lbs. Scleroscope hardness 27. Elongation and reduction in area, 2 to 5 per cent.

Illium is insoluble in nitric and sulphuric acids, slightly attacked by hydrochloric acid but not enough to damage it for industrial work.

Immune to concentrated alkalis and ammonium salts.

Illium machines readily.

Illium may be obtained in form of wire and sheets.

## ILLIUM LABORATORY WARE

Illium crucibles, ashing dishes, Gooch crucibles, and evaporating dishes may be obtained in all standard sizes.

Business Established 1909

# THE STANDARD CARRIER COMPANY

ESTIMATING DEPARTMENT

112 East 41st Street  
NEW YORK, N. Y.

FACTORY: Plantsville, Conn.

## PRODUCTS

High grade Conveying Systems which include: Pneumatic Dispatch Tube Systems, Belt Conveyors, Wire Line Cash and Package Carriers, Cable Carriers, Tray Conveyors, Sweep-off and Pick-up Carriers, Hand Power and Push Button Light Lifts.

## USES

Standard carrier systems are extensively used in offices, factories, stores and wherever materials, messages or money is handled between floors, departments or buildings.

## GUARANTEE

Every endeavor has been made to fully meet the most exacting conditions to which any and all parts of the Standard systems are subjected; and they are backed by liberal guarantees, made by a responsible and financially strong company.

## COOPERATIVE SERVICE

The services of the engineering department are available without charge or obligation of any kind. Address Estimating Department, 112 East 41st Street, New York.

For estimating purposes, we need a floor plan or diagram, locating the points to be served, story elevations; voltage, etc., available for power and the maximum size of number of papers or materials to be conveyed.

## TYPES

We manufacture every known type of carrier service suitable for mechanical messenger work within and between buildings. This enables us to select the type of service best suited to our customer's requirements.

## DESIGN

All our service has been designed and developed under the personal supervision of carrier men of many years' experience manufacturing and installing carrier systems. The result is the best possible service, easy to install and maintain, and economical in both cost and operation.

## PNEUMATIC TUBE SIZES

Tube systems are gauged by the outside diameter of the transit tube. The following table shows the inside diameters and lengths of standard size tubes and message carriers.

Size		Carrier Inside Diameter	Maximum Inside Carrier Length
1 1/4"	Round	7/8"	5"
2 1/4"	"	1 1/2"	10"
3"	"	1 7/8"	12"
4"	"	2 3/8"	14"
5"	"	3 3/8"	15"
3" x 6"	Oval	1 3/4" x 4 1/4"	12"
4" x 7"	Oval	2 3/4" x 5 3/4"	14"
2 1/4"	Cash Carriers are	1 5/8" x 3 1/2" inside	"

Varying lengths of carriers can be used in the same system. Bends must be provided to fit the longest carrier used.



**PNEUMATIC TUBE CARRIERS**

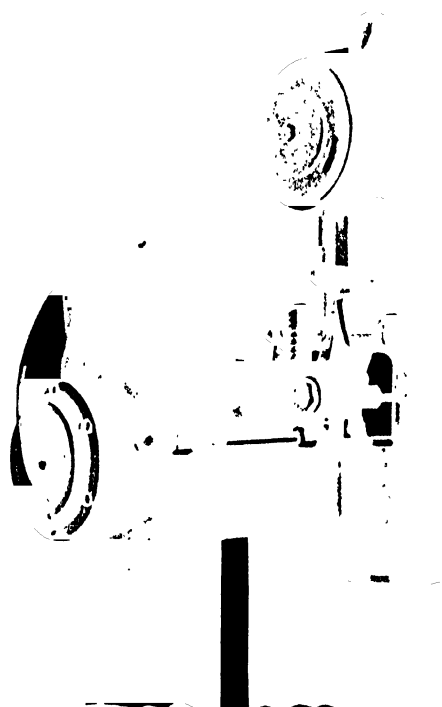
In which messages or materials are conveyed

## CARRIERS FOR SPECIAL REQUIREMENTS

Carriers may be adapted to any special requirement.

One steel mill transports a 5 lb. red-hot test piece from its furnaces to the laboratory 1800 ft. away.

Another plant sends eight samples in envelopes and saves over \$5000.00 per month by getting test reports back promptly.



**PNEUMATIC TUBE TERMINAL**

A carrier dispatched through a pneumatic tube will travel any distance at the rate of 40 ft. per second.

# THE STANDARD CALORIMETER COMPANY

Parr Calorimeters and Apparatus for Fuel Testing—Products of Acid-Resisting Alloy—Illium

EAST MOLINE, ILLINOIS

## PRODUCTS

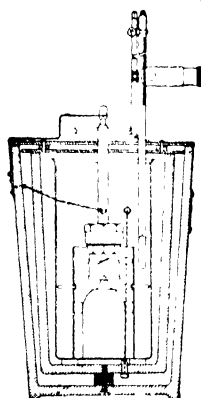
Parr Calorimeters, Illium Castings, Illium Laboratory Ware, etc. Parr Sulphur Bombs, Parr Sulphur Photometer, Parr Total Carbon Apparatus, Needle Valve for Combustion Work, Release Valve for Oxygen Bombs.

## PARR STANDARD CALORIMETER

This well known type of calorimeter, in which sodium peroxide is used as the medium of combustion, is marked advantages over the old pattern bomb as follows:

- 1 Fusion cup removable
- 2 Extra cup supplied allows making of duplicate determinations.
- 3 Fusion cup made of special alloy most resistant of all metals to melted alkali
- 4 Cup comes to red heat, insuring complete combustion

Price—Calorimeter complete with thermometer, \$100.00. Stirrer motor for calorimeter, \$30.00. Peroxide Bomb alone, \$40.00.



PARR STANDARD CALORIMETER

## PARR OXYGEN BOMB CALORIMETER

This calorimeter is equipped with an oxygen bomb of Illium, which for calorimetric purposes is the exact equivalent of platinum. Being turned from solid metal this bomb overcomes the difficulties in the operation of lined bombs and the corrosion in the shell under the lining of even platinum bombs.

This calorimeter is furnished in the plain type with indurated fiber jacket and also with adiabatic jacket.

The adiabatic jacket makes it possible to maintain the temperature of the jacketing water at the same stage as that of the inner system. Thus uncertain and complicated corrections for radiation are avoided. This instrument is adapted to precise work of the most exacting degree of refinement.

Prices—Oxygen Bomb Calorimeter (plain type without thermome-

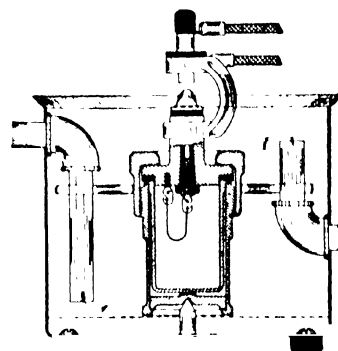
ter), \$300.00. Adiabatic type, without thermometer, \$400.00. Illium Bomb (alone), \$225.00. Thermometer with B. of S. certificate 65°-90°, \$12.00, 65°-105°, \$15.00. Stirrer Motor, \$30.00.

## PARR SULPHUR BOMB

For organic and inorganic sulphur and organic halogens to replace the Carius Method. Particularly recom-

mended for use in fuel testing laboratories, research departments, rubber factories, organic laboratories, food laboratories, analytical laboratories, soil surveys.

By use of the Parr Sulphur Bomb sulphur determinations can be made in the quickest and most accurate manner. The bomb is furnished in three types. Electric ignition with water jacket, \$40.00. Electric ignition without jacket, \$31.50. Bomb for heat ignition, \$25.00.



SULPHUR BOMB WITH WATER JACKET

## PARR SULPHUR PHOTOMETER

The solution from the Parr Sulphur Bomb or Parr Standard Calorimeter is brought to slight acidity. Aliquot part of solution taken. Barium salt added. Shaken. Photometer now gives direct reading indicating percentage of sulphur in sample. Price, \$40.00.

## PARR TOTAL CARBON APPARATUS

Acid is added to residue from determination of heat values, the carbon dioxide gas is measured by this apparatus and total carbon readily determined. Available hydrogen can also be determined. Price, \$52.00.

## NEEDLE VALVE FOR COMBUSTION WORK

By use of this valve it is possible to count bubbles passing through absorption train. Price, \$5.00.

## RELEASE VALVE FOR OXYGEN BOMBS

Price, \$5.50.

## ILLIUM CASTINGS, LABORATORY WARE, ETC.

Castings of this alloy have a tensile strength of 85,000 lbs. per square inch, melting-point 1280°C., Brinnell test for hardness 170 to 200 at 3000 lbs. Scleroscope hardness 27. Elongation and reduction in area, 2 to 5 per cent.

Illium is insoluble in nitric and sulphuric acids, slightly attacked by hydrochloric acid but not enough to damage it for industrial work.

Immune to concentrated alkalis and ammonium salts.

Illium machines readily.

Illium may be obtained in form of wire and sheets.

## ILLIUM LABORATORY WARE

Illium crucibles, ashing dishes, Gooch crucibles, and evaporating dishes may be obtained in all standard sizes.



# STANDARD SCIENTIFIC COMPANY

Manufacturers and Dealers

CORNER OF 4TH AND BARROW STREETS, NEW YORK, N. Y.

## PRODUCTS

Laboratory Apparatus and Chemicals.

## FACILITIES

Consider our stock, manufacturing equipment and service when in the market for scientific instruments and laboratory supplies. Described in various catalogs and other publications, which will be sent to prospective purchasers.

## PHYSICAL APPARATUS

Calipers, Vernier and Micrometer Screw  
Clamps and Supports  
Stopwatches, Seconds Pendulums and Electrical Contact Timing Devices  
Vacuum and Pressure Pumps  
Manometers and Gauges  
Bell Jars  
Barometers, Aneroid and Mercurial, including Barometer Tubes  
Thermometers, Mercurial and Metallic  
Radiometers  
Vacuum Bottles  
Meteorological Instruments, including Hygrometers, Rain Gauges, Anemometers, etc.  
Acoustic Apparatus, including Tuning Forks, Resonators, and Electric Driven Forks  
Small Synchronous Motors  
Glass Mirrors, Prisms and Lenses  
Optical Benches  
Spectroscopes and Spectrometers  
Measuring and Reading Microscopes and Telescopes, Filar Micrometers, etc.  
Cathetometers  
Magnetic Compasses and Dipping Needles  
Leyden Jars  
Magnets, Bar, Horseshoe and Electro  
Electroscopes for Radioactivity and Ionization  
Static Machines  
Binding Posts and Connectors  
Batteries  
Rheostats, Lamp-Banks, etc.  
Galvanometers, including Voltmeters and Ammeters  
Induction Coils  
X-Ray Outfits

## CHEMICAL APPARATUS

Alundum ware  
Balances and Weights  
Beakers  
Bottles  
Bunsen Burners, Alcohol Lamps, etc.  
Burettes  
Calorimeters  
Casseroles  
Centrifuges  
Clamps and Supports  
Condensers  
Corks  
Crucibles  
Cylinders, Graduated and Plain  
Desiccators

Distillation Apparatus  
Drying Ovens  
Evaporating Dishes  
Electrolytic Apparatus  
Extraction Apparatus  
Filtering Paper  
Flasks  
Funnels  
Gas Apparatus  
Glass Tubing  
Graduates  
Hydrometers  
Jars  
Mortars  
Ovens  
Pipettes  
Platinum  
Pyrometers  
Quartz Ware  
Retorts  
Rubber Stoppers, Tubing, etc.  
Stopcocks  
Siphons  
Test Tubes  
Thermometers  
Water Baths

## CHEMICALS AND MINERALS

Mercer's, Baker's, etc.

## PROJECTION APPARATUS

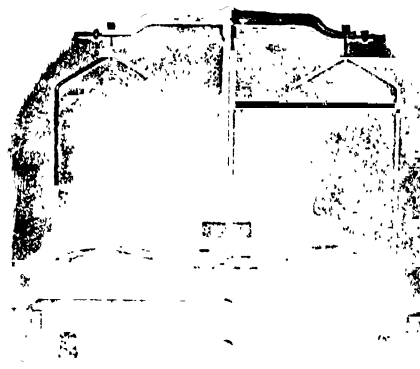
Lanterns, Stereopticons, Screens and Accessories

## PHOTOGRAPHIC SUPPLIES

Cameras  
Lenses  
Chemicals  
Paper, Films and Negatives

## BIOLOGICAL APPARATUS

Microscopes and Microtomes  
Slides and Cover Glasses  
Dissecting Instruments  
First Aid Cabinets  
Charts and Models



### ONE OF OUR SPECIALTIES

Laboratory Balance B645, capacity 500 grams, sensibility 1 decigram, beam 7 1/2 inches between knife edges.  
Price \$9.00 each. Special reduction will be made in quantity.

# STANDARD WATER SYSTEMS CO.

Engineers, and Manufacturers of

**Tripure Water Stills**

50 CHURCH STREET, NEW YORK, N. Y.

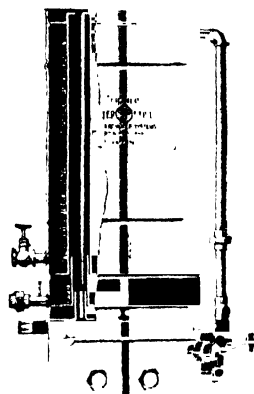


## PRODUCTS

**Water Stills for every laboratory and commercial use.**

## LABORATORY WATER STILLS

**Construction**—These Water Stills are made by skilled workmen with the highest grade of materials. The shells are heavily nicked copper; the tubes and coils are of seamless drawn copper, and the chambers are of the finest cold rolled copper. All surfaces coming in contact with the steam and the distillate are heavily lined with pure block tin to insure the purity of the product.



**TRIPURE LABORATORY  
WATER STILL**

**Heating Methods**—These Stills are furnished to be operated by gas, electricity, steam, or kerosene.

**Capacities**—The Tripure Water Still is supplied in capacities from the smallest laboratory sizes to the largest industrial units furnishing a product of the greatest purity.

**Record of Purity**—Tripure Water is indorsed by leading chemists in the strongest terms for its purity, for all sanitary purposes, as well as in all of its applications for technical work.

## SOME INSTALLATIONS

Acheson Oildag Co., Port Huron, Mich.  
Barrett Company, Undercliff, New Jersey  
National Aniline & Chemical Co., Buffalo, N. Y.  
General Chemical Co., Undercliff, New Jersey  
Columbia College of Physicians & Surgeons, New York City.  
Cornell University, Ithaca, New York.  
International Harvester Co., Chicago, Ill.  
Rockefeller Institute for Medical Research, Plainboro, N. J.  
U. S. Bureau of Standards, Washington, D. C.  
U. S. Department of Agriculture, Washington, D. C.  
U. S. Naval Hospital, Portsmouth, Va.  
E. I. du Pont de Nemours Co., Wilmington, Del.  
Hooker Electrochemical Co., Niagara Falls, N. Y.  
Hanovia Chemical Co., Newark, New Jersey.  
General Electric Co., Schenectady, N. Y.  
Colgate & Company, Jersey City, N. J.

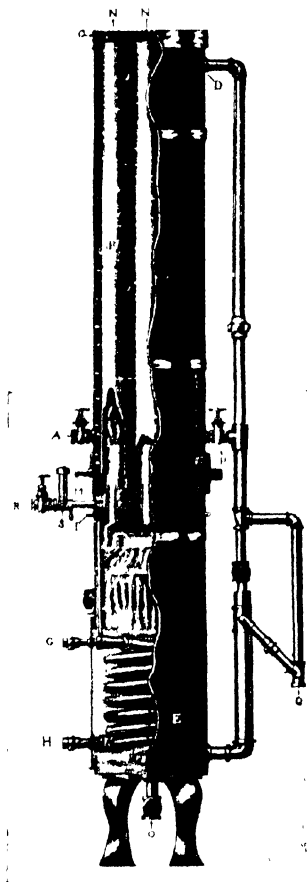
## EXCLUSIVE FEATURES

Our Tripure Laboratory and Industrial Water Stills will produce their full capacity with 10 lbs. to 25 lbs. steam pressure.

The top of the condenser is open and insures the elimination of all impure gases during the process of distillation.

The process of aeration which can be operated or not consists of admitting by suction into the steam thoroughly sterilized air in the proper quantities before condensation resulting in a distillate remarkably palatable, which process is controlled by patents.

**WRITE FOR CATALOGS**



**TRIPURE INDUSTRIAL TYPE**

# STEACY-SCHMIDT MANUFACTURING CO.

Lime Kilns and Complete Hydrating Plants  
ARCH STREET, YORK, PA.

Code Address  
Codes used, A, B, C  
Edition and West

## PRODUCTS

Keystone Lime Kilns  
Complete Lime and Hydrating Plants  
Belgian and other type kilns for extrac-  
tion of Carbon Dioxide Gas  
Equipment for Eldred Process of Burning  
Turntables Bag Filters  
Sugar Machinery Crystallizers  
Char Kilns Stacks  
Dryers Tanks  
Evaporators Castings  
Special Equipment from Engineers' designs

## KEYSTONE LIME KILNS

These Kilns are extensively installed throughout all the important lime producing centers of the United States, Canada, Mexico, Peru, Chili, Cuba, Porto Rico,



GAS FIRED KEYSTONE LIME PLANT, CALCIUM PRODUCTS CO., HOLLIDAYSBURG, PA.

Africa and South America, where they are satisfactorily meeting the demands of operators. Use of these Kilns guarantees uniform calcination, lowest operation and maintenance costs and a well-sustained tonnage.

**Construction**—The extraordinary strength and durability of the Keystone Kiln is explained by the high quality, all-steel, brick-lined construction. This insures continuous operation and absolute dependability from breakdown. Cross section view of the Kiln, shown on the right, illustrates all the important features of construction and design.

**Fuel**—Keystone Kilns are designed to efficiently burn either coal, wood, producer gas or oil as fuel. The sim-

**KEYSTONE  
LIME  
KILNS**

plecity of the Kiln permits easy and pensive transfer from one fuel burning tem to another,—should original oper conditions change and require such a

## Specifications—

Outside diameter of Kiln 11 ft.  
Height of Kiln 14 ft.  
Diameter of Kiln inside brick lining 8 ft.

**Capacity**—The capacity of the standard Kiln is dependent both upon the nature and quality of the rock to be burned and the kind and grade of fuel used. Experience has shown that 8 to 10 tons of lime may be produced per day, using coal or wood as fuel and 12 to 15 tons per day when oil is burned. Where producer gas is employed these figures will be increased to 18 to 25 tons per day.

**Draft**—Wherever desired and specified, we are in an excellent position to supply necessary equipment for burning with the aid of either forced or induced draft,—use of which will mean increased capacity often as high as 10% to 15%. Details will be gladly given upon request.

## Eldred System

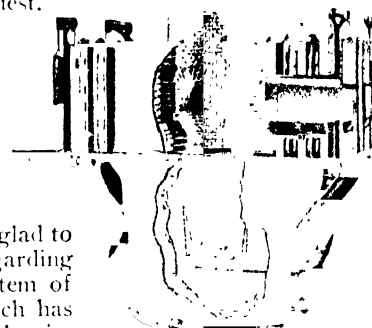
—Keystone Kilns can be made adaptable for burning by means of the Eldred Process, using coal as fuel. We will be glad to give details regarding this patented system of burning lime which has brought decided increased production and numerous economies for many lime operators.

**Special Features**—One of the many exclusive features that has brought an envious reputation to Keystone Kilns is the cooling cone with patented draw gates. (See Illustration.) This allows, when drawing the lime, to load direct into a box car, eliminating the extra handling caused by having the lime discharged upon the floor until cold.

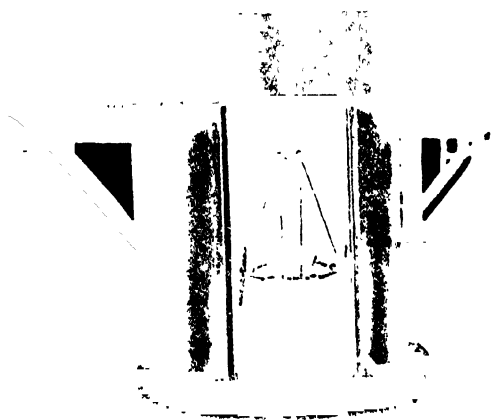
## ENGINEERING SERVICE

Our Engineering Department is ready at all times to furnish complete information regarding Keystone Standard Lime Kilns or any equipment manufactured by this company.

This department is composed of men thoroughly experienced in lime burning machinery and is well prepared to aid in the solution of difficult problems and to furnish complete lime and hydrating plants, either from our own specifications and designs or those submitted by the client.



SECTIONAL VIEW  
KEYSTONE LIME KILN



VIEW SHOWING KEYSTONE KILN  
SET AT RIGHT ANGLES TO DRAW



# THE STEARNS CONVEYOR CO.

Engineers, Manufacturers

Conveying, Elevating and Screening Equipment

EAST 200TH ST. AND ST. CLAIR AVE., CLEVELAND, OHIO

## PRODUCTS

Belt and Chain Elevators  
 Lehr Conveyors  
 Belt Conveyors  
 Pivoted Bucket Conveyors  
 Pan Conveyors  
 Screw Conveyors  
 Apron Conveyors  
 Complete Screening Plants  
 Coal Handling Equipment  
 Ash Handling Equipment

## FEATURES OF BELT CONVEYOR CONSTRUCTION

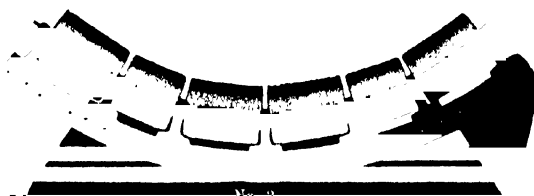
The pulleys of the conveyor idler are supported by heavy cast-iron castings (see No. 2) which are bolted on an angle iron base. The purpose of the angle iron construction being to prevent the collection of material below the pulleys, and eliminate the possibility of them becoming clogged. The angle iron also insures proper alignment of the pulleys at all times.



No. 1  
**STEARNS GRADUAL TROUGHING TYPE BELT CONVEYOR**

The mechanical construction and method of lubrication of the Stearns belt conveyor idler is unusual (see No. 3). The common faults of disalignment and improper lubrication have been eliminated. Perfect alignment is assured by mounting Hyatt Roller Bearings on a single piece of seamless tubing. The outer race for the roller bearing is another piece of seamless tubing which carries the pulley itself. Thus the two roller bearings are always perfectly aligned.

Upon proper lubrication depends the life of any machine. All Stearns conveyor idlers are equipped with the well known Alemite Lubricating System that is in use on many automobiles. The upper bearings on the

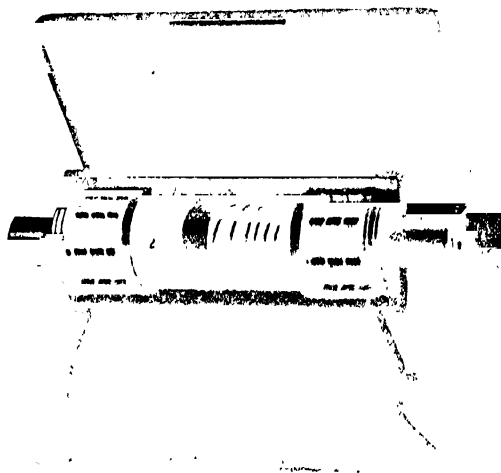


No. 2  
**BELT CONVEYOR IDLER WITH ALEMITE LUBRICATING PLUGS**

inclined pulleys in all common forms of idlers suffer from lack of proper lubrication because gravity pulls the grease away, allowing the bearings to run dry. The Stearns pulleys are provided with grease chambers with floating plungers to force the grease to the upper Hyatt Bearings. The Lubricant is thus forced from the center out, providing a seal against grit and dirt. It is only necessary to lubricate once or twice a year, which can be done while the conveyor is in operation, by means of an Alemite grease gun.

The three principal causes for shortening the life of the idler have been improper lubrication, grit, and disalignment. With these difficulties eliminated the life of the equipment is greatly prolonged. The cost of maintenance, expense of repairs, and inconvenience are reduced to a minimum.

The case of the belt conveyor is typical of the mechanical refinements of all Stearns products.



No. 3  
**SINGLE IDLER PULLEY**

Grease enters at 1, passes through 2, filling grease reservoir and pressing back plunger

# THE A. T. STEARNS LUMBER CO.

BRANCH OFFICES  
166 Devonshire St. Boston  
19 Federal St.

MAIN OFFICE  
NEPONSET, BOSTON, MASS.

SALESROOM  
1 Sudbury St. Haymarket Square  
Boston

## PRODUCTS

Wooden Tanks for all purposes of any size, round or rectangular, including Storage Tanks, Vats, Acid Towers and Blow Tanks.

Paper Mill work a specialty.

## STOCK AND FACILITIES

We control cypress swamps and sawmills in Florida where we make the lumber into the proper thickness and sizes for use in our factory at Neponset, Boston, Mass.

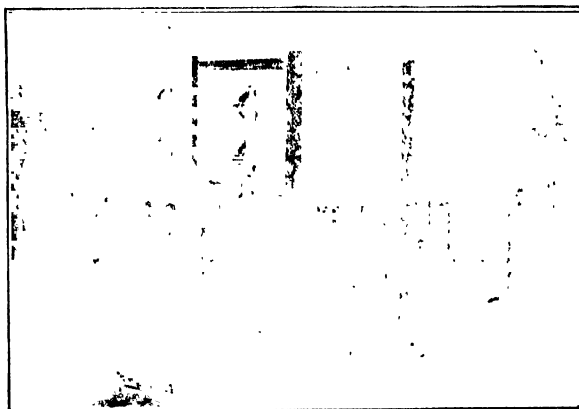
As we carry large quantities of cypress in stock seasoning we can construct and ship promptly. We also build tanks of southern pine for paper mill and other work.



FIVE CYPRESS TANKS AT THE NORTH EASTERN ELECTRIC SMELTING CO.'S PLANT, WALLSEND-ON-TYNE, ENGLAND

Cypress is our specialty because its natural element makes it especially adaptable for use in tanks.

Our tank factory occupies a separate building fitted with special machinery designed expressly for the manufacture of tanks and kindred articles, large or small, including all necessary hoops or other iron work.

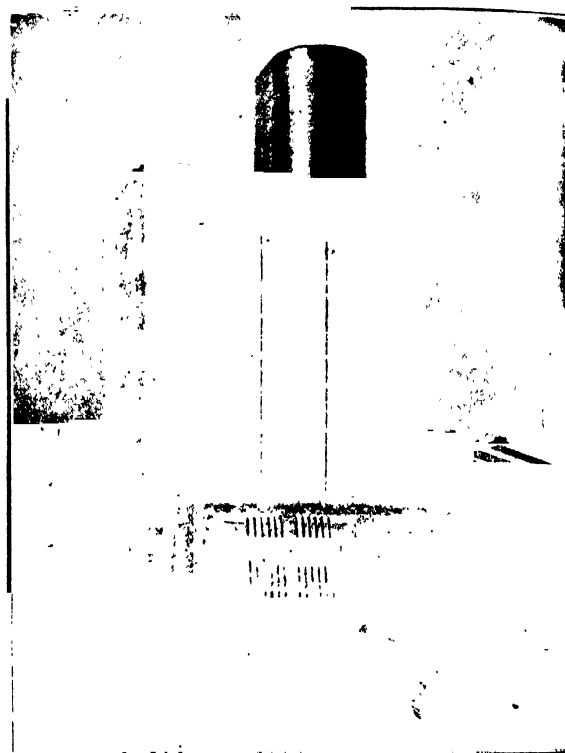


TANK INSTALLED FOR HOLLINGSWORTH & WHITNEY IN PAPER MILL AT WATERVILLE, MAINE

## CYPRESS

This wood is probably more extensively used at the present time in paper, pulp and textile mills, chemical

plants, dyehouses, breweries, etc., for the construction of tanks, vats, flumes, etc., than any other kind of lumber. It is also extensively used for floors exposed to dampness. The wonderful durability of cypress and its freedom from taint, taste, or odor make it especially desirable for such purposes.



ACID TOWERS FURNISHED BY US FOR THE DONNACONA PAPER COMPANY, DONNACONA, P. Q., CANADA

The three acid towers shown are sixty feet high and six feet in diameter inside. The large storage tank at the right of the picture is twenty-five feet in diameter and twenty-two feet eight inches high with a capacity of sixty thousand gallons.

## SIZES AND CAPACITIES

We build box tanks of cypress in a very large number of sizes ranging in capacity from 25 gallons to 30,000 gallons.

We build round tanks of cypress in a great variety of diameters and heights, ranging in capacity from 25 gallons to upwards of 125,000 gallons.

We also build half-round tanks and special tanks for chemical and other plants fitted with partitions, agitators, etc.

## SPECIAL WORK

We have furnished for pulp mills, both in the United States and Canada, a type of tank, or tower, over one hundred feet in height. We also furnish material for penstocks, which may be built of unlimited length. We are furnishing large quantities of lumber for flumes, dams, and other structures in or about water-power plants, and it has given excellent satisfaction. Our workmanship is the very best obtainable.

# STEDMAN'S FOUNDRY AND MACHINE WORKS

Established 1834

AURORA, INDIANA

## PRODUCTS

Crushing, Grinding, Pulverizing, Mixing and Screening Machinery.

### HEXAGON SCREEN WITH VIBRATING DEVICE

This Screen is cleaned automatically—No labor required. By a simple mechanical contrivance, due to numerous experiments made by us, we are now prepared to demonstrate to your entire satisfaction how the Stedman Hexagon Revolving Screen can handle

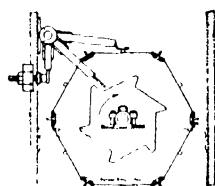


HEXAGON SCREEN

your materials without the old and antiquated methods of employing labor to periodically clean away material from the Screen caused by clogging.

Perhaps you have been content with mixing and screening your materials with attendant difficulties, which may be trifles in your estimation, but nevertheless, a big factor in your costs. **Now**—these difficulties have been eliminated by the development of a practical, mechanical agitation to clean the Screen Cylinder and prevent it from clogging.

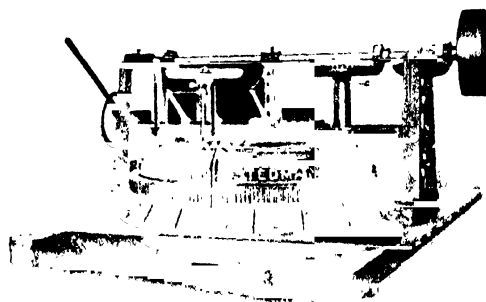
Screen plates have also been constructed so you can change them very quickly in a simple manner. Ask for Bulletin 105.



DETAILS OF VIBRATING DEVICE WHICH KEEPS WIRE CLOTH CLEAN

### MIXING PANS

For mixing in batches either wet or dry materials to a uniform consistency our Mixing Pans are particularly well adapted for such manipulating. We make a number of different styles and sizes to give any required capacity and to suit special installation conditions. We build 5, 6, 7 and 8 ft. Double and 5, 6 and 8 ft. Single, all of which are fully described in our Catalog No. 14.



MIXING PAN

The above illustration is our new 8' x 30" Double Mixer Model "D".

Practical in design and rugged in construction.

Ball bearing race surrounding the pan designed to give long service. Note oilers.

Large opening in center of pan to discharge quickly.

Operating lever located at side of pan, which leaves the cover clear for feed connections.

Ball Thrust Bearings under the bevel gears that drive the revolving plows.

Pan 8 ft diameter, 30 ins. deep inside. Easy two-ton capacity at a charge.

Low power consumption, minimum cost of installation, all parts accessible and low upkeep cost.

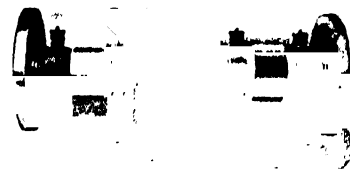
Write for Bulletin 104

### DISINTEGRATORS

Our Ball Bearing Disintegrators have in many cases effected economies over other types of Pulverizers and Grinding Machines in reducing to the desired fineness such materials as Lathopone, Copra, Copra Cake, Linseed Oil Cake, Castor Beans, Colors and all kinds of Chemical Materials, White Lead and all other materials similar in composition. The illustration shown here is our 26" Mill. Belt driven machines are recommended on speeds up to 1000 R. P. M. In order to pulverize some materials to the proper fineness a speed of 1000 to 2000 revolutions to the cages or grinding parts is necessary, and for this higher speed the direct driven machine has been found not only more satisfactory but more economical.

We also build 30", 36", 40", 42", 44", 50" and 60" Belt Driven Disintegrators with special babbitted bearings, and we are in position to furnish any of the above sizes in 2, 3, 4 and 6 cage Mills.

Catalog No. 12 and Bulletin No. 102 describe our complete line of Disintegrators.



DISINTEGRATOR

**FJS****F. J. STOKES MACHINE CO.**

PHILADELPHIA, PA.

**FJS****PRODUCTS**

Rotary Vacuum Dryers	Drum Dryers
Vacuum Shelf Dryers	Autoclaves
Automatic Water Still	Mixers
Impregnating Apparatus	Nitrators
Vacuum Evaporators	Vacuum Pumps
Barometric and Surface Condensers	
Special Apparatus to Buyer's Specifications	

**COMPLETE PHARMACEUTICAL LINE**

Single, Multiple and Rotary Tablet and Briquette Compressors.

Coating Machines	Polishing Machines
Ball Mills	Pot Mills
Power Mortars	Mixers
Granulators	Percolators
Emulsifiers	Bottle Fillers
Open and Vacuum Stills	Jacketed Kettles
Gelatine Capsule Machinery	Belt Conveyors
Tablet Triturate Molds	
Suppository Molds of Brass, Aluminum, etc.	

**ATMOSPHERIC DRUM DRYER**

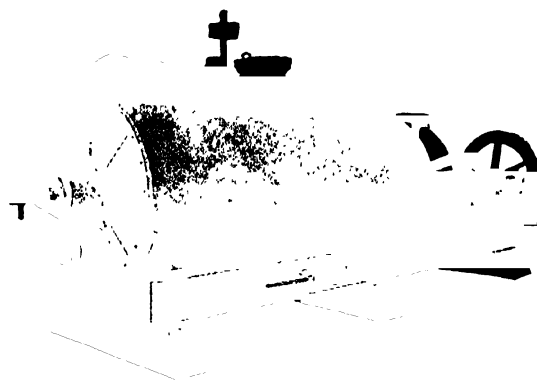
This Dryer is well adapted to the drying of precipitates, such as iron oxide, lead peroxide, arsenate of lead, etc., and also to the crystallizing of concentrated solutions, such as sodium benzene sulphonate. The liquor is fed continuously to the lower surface of the steam heated drum. It dries as the drum revolves and is scraped off in the form of a dry powder, which falls into a conveyor. Circulation and agitation of the feed liquor prevent precipitates from settling and insure an evenly dried product. The scraper knife is made of thin spring-brass and is reversible and easily renewed, and cannot injure the surface of the drum.

**ATMOSPHERIC DRUM DRYER**

We always recommend the installation of a variable speed transmission in connection with this dryer, so that the speed can easily be changed to suit the feed liquor, and to control the moisture content of the dry product. Thin liquors dry rapidly and require a greater speed than heavier liquors.

**STOKES ROTARY VACUUM DRYERS**

These are the most efficient dryers for material that can be tumbled while drying, such as starch, white lead, reclaimed rubber, crystals of various kinds, fish scrap, etc. These dryers are also very efficient in the **recovery of valuable solvents** such as alcohol and naphtha. The central shaft of our dryers carries a set of spiral mixing blades arranged in such a manner that the charge is thoroughly and constantly mixed and is distributed evenly in the dryer, insuring a uniformly dry product. When drying is complete the spiral blades sweep the material to the center of the machine where it is discharged, through a discharge outlet that can be operated without going under the machine. Our dry dust filter catches all the dust which would otherwise foul the condenser and pump, and keeps it dry so that it may be added directly to the main output of the dryer. We also supply all the necessary auxiliary apparatus, Barometric and Surface Condensers, Vacuum Pumps and Circulating Pumps.

**ROTARY VACUUM DRYER**

The Rotary Vacuum Dryer has recently been adapted to the **recovery of grease and oil** from various materials such as garbage, slaughter house residues, fish scrap and oil-press cake. The whole process of extraction and drying is carried out in the dryer. Solvent and grease are separated in a direct steam still. Solvent remaining in the dryer is recovered during the drying process in a surface condenser.

**DATA**

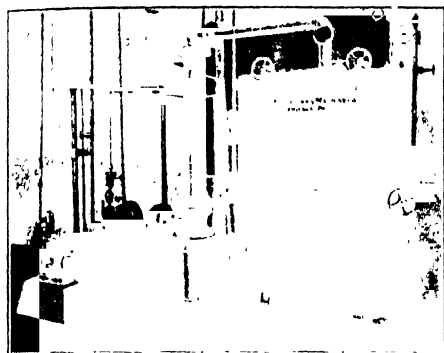
Size	Drying chamber	Heating surface sq. ft.	Working capacity cu. ft.	Overall dimensions		
				Height	Width	Length
59-A	1'6" x 3'6"	17	3	1'	2'	3'
59-AA	2'0" x 6'0"	38	10	4'	3'	6'
59-AB	2'6" x 8'0"	63	20	5'	4'	11'
59-B	3'0" x 15'0"	164	50	6'	5'	14'
59-C	4'0" x 20'0"	314	125	6'	6'	21'
59-D	5'0" x 25'0"	550	200	7'	7'	26'

Note: Dryers of the above standard diameters can be furnished in other lengths than those listed above.

*Continued on Next Page*

### VACUUM SHELF DRYERS

These dryers are used for all kinds of materials that can be tumbled in pans or in sheets. Materials sensitive to heat and oxidation are dried rapidly and uniformly at a temperature which is under ready control. If the material to be dried is especially sensitive to heat hot-air circulation is used for heating in the place of steam. The shelves are made seamless by electric welding and are tested to stand 100 pounds pressure. A shelf can be quickly removed without disturbing the others.



VACUUM SHELF DRYER

This type of dryer uses steam very efficiently as the steam does not come in contact with the external shell and there is consequently little loss by radiation.

The labor cost on this type of dryer runs higher than on the rotary and drum types. It is used for a large number of products which cannot be tumbled while drying, such as foods, chalk-cones, percussion caps, wood and various other materials the physical properties of which must be preserved.

VACUUM SHELF DRYERS NO. 54 (Shelves 58" x 80")

Size	Number of Shelves	Clearance between	Shelf area sq. ft.	Heating surface sq. ft.
4-A	23	2 1/4"	741	1518
4-BB	20	2 6/8"	644	1316
4-B	17	3 1/8"	547	1144
4-CC	16	3 6/8"	515	1077
4-C	13	4 7/8"	419	875
4-DD	14	2 0/8"	451	942
4-D	12	2 6/8"	386	807
4-E	11	3 0/8"	354	740
4-F	10	3 4/8"	322	673
4-G	9	4 0/8"	290	605
4-H	8	4 7/8"	258	539

VACUUM SHELF DRYERS NO. 55 (Shelves 44" x 40")

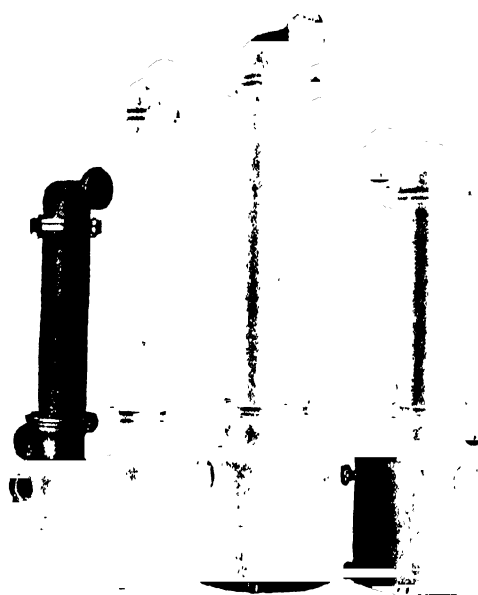
Size	Number of Shelves	Clearance between	Shelf area sq. ft.	Heating surface sq. ft.
5-A	23	2 0/8"	281	598
5-BB	20	2 5/8"	241	520
5-B	17	3 1/8"	207	442
5-CC	15	3 7/8"	183	390
5-C	14	4 1/8"	171	364
5-DD	14	1 9/8"	171	364
5-D	12	2 5/8"	147	312
5-E	11	2 8/8"	134	286
5-F	10	3 2/8"	122	260
5-G	9	3 7/8"	109	234
5-H	8	4 5/8"	97	215
5-CC	7	2 0/8"	85	182
5-C	6	2 7/8"	73	156
5-BB	5	3 6/8"	61	130
5-B	4	5 1/8"	49	104

We also build a small shelf vacuum dryer for laboratory use. The shelves are 12" x 18" and the clearance space is 4". A condenser and receiver form the stand of the dryer.

### SURFACE CONDENSERS

The illustration shows an assortment of our vertical surface condensers. They are equipped with either brass or iron condensing tubes, depending on the requirements. They are mounted on receivers for collecting the condensate and are provided with windows for observing the flow of the condensate. They are also equipped with a by-pass and valve for draining without interrupting the action of the apparatus.

We also manufacture barometric condensers in various capacities, to be used in connection with our vacuum dryers and vacuum evaporators.



SURFACE CONDENSERS

Size of Apparatus	A	B	BS	C	D	DS
Cooling Surface, Sq. Ft.	18	30	44	51	79	130
Overall Height	6'8"	8'8"	8'8"	7'9"	9'9"	9'9"
Capacity of Receiver, Gals.	20	20	20	60	60	60

### VACUUM EVAPORATORS

Vacuum evaporators of the standard type both single and multiple effect we build in various sizes, of cast iron, steel, or copper. Standard diameters are 30, 36, 42, 48, 60, 72, 84 and 96 inches. The height varies according to the nature of the liquid to be evaporated. We also build crystallizing evaporators.

Jacketed evaporators of the type used in pharmaceutical laboratories are built by us, standard sizes being 25, 50, 75, 100, 250, and 500 gallons. These are usually built of copper either plain or tin-lined. We also make them of steel plate.

These evaporators are equipped with various kinds of condensers depending on the size and the purpose of the evaporator. On small installations, especially when the distillate is of value, we supply surface condensers as listed above. On larger installations where the distillate is not valuable we supply either the barometric condenser or a jet-condensing pump.

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STEAM OPERATED  
STILL

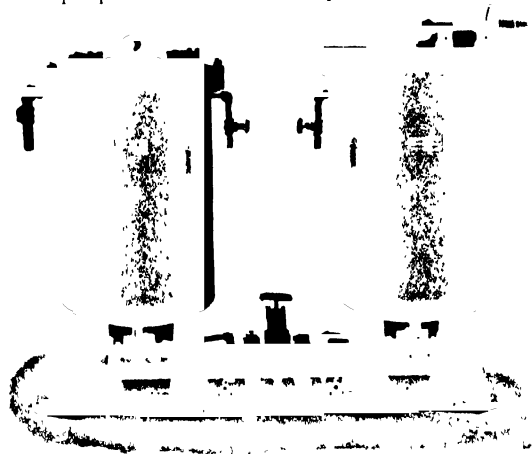
We have over five thousand water stills in operation, in a very wide field, including chemical laboratories, industrial plants, hospitals, wholesale and retail drug houses. The government purchased about five hundred of our small kerosene operated stills for use in base and field hospitals.

Size	Heat	Gals. per hour
0	Gas	1 1/2
0	Gasoline	1 1/2
0	Electric	1 1/2
00	Gas	2 1/2
00	Steam	2 1/2
000	Gas	3 1/2
000	Steam	3 1/2
1	Steam	5
2	Steam	10
3	Steam	25
4	Steam	60
5	Steam	100

We also furnish Multiple Effect Stills for the production of pure water in large quantities. Quotation on application.

#### IMPREGNATING APPARATUS

Impregnating apparatus for the treatment of field and armature coils, pencil slats, and wood blocks for various purposes is one of our specialties. The tanks



IMPREGNATOR

are arranged for the use of heat, vacuum, and pressure to assist in forcing the compound into the pores of the material treated. These tanks can be made in any size.

#### AUTOMATIC WATER STILLS

An extremely simple and efficient water still, easy to operate, easy to clean. Water which is to be evaporated is preheated by the condensation of the water already evaporated. Gases thus are liberated. Connections between the boiling chamber and the condenser keep the water at a constant level and make the operation continuous and automatic. The stills are made in a variety of sizes as listed below and can be operated with almost any source of heat.

We have over five thousand water stills in operation, in a very wide field, including chemical laboratories, industrial plants, hospitals, wholesale and retail drug houses. The government purchased about



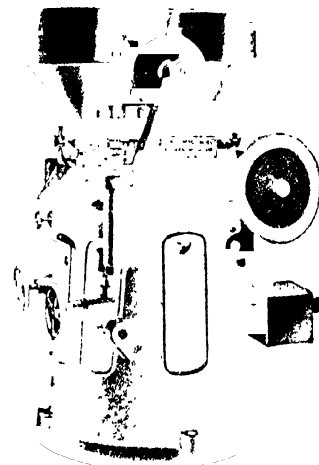
GAS OPERATED STILL

We have standardized tanks having diameters of 24, 36, 48, and 72 inches. The tanks are heated by steam, gas, or hot liquid as the conditions require.

#### BRIQUETTE AND TABLET COMPRESSING MACHINES

We manufacture automatic machines for making tablets and briquettes and for counting and packing these into suitable containers. Sizes run from the smallest up to three inches in diameter, and almost any shape desired. Output up to 1500 per minute for small tablets and from 40 to 250 per minute for large briquettes.

We have had wide experience in the manufacture of tablets and briquettes of all kinds. It is our custom to conduct experiments on any materials sent us, submit samples, and make recommendations free of all charge.



TABLET MACHINE

#### MIXERS

The illustration shows a steam-jacketed steel mixer. It is equipped with spiral mixing blades, similar to those used in our Rotary Vacuum Dryers, and has a bottom discharge. The structural steel frame makes this machine long-lived and dependable for the heaviest kinds of work. We also make mixers of galvanized



STEAM-JACKETED MIXER

iron, cast iron, aluminum, bronze, etc., either with or without steam-jackets. Some of our mixers are arranged to tilt for discharging. This is sometimes more convenient than the bottom discharge.

#### POWDER FILLING MACHINES

These machines fill accurately all kinds of powders into a great variety of containers, at the rate of 20 to 30 packages a minute, depending on the size. Full information may be obtained on request.

#### LITERATURE

Catalogs will be mailed on request, giving full details regarding our complete line of—

**Vacuum Dryers and Chemical Apparatus; Chemical and Pharmaceutical Machinery; Stokes Automatic Water Stills.**



## E. H. STROUD & COMPANY

ESTABLISHED 1896

928, 930, 932 and 934 Fullerton Avenue  
CHICAGO, ILLINOIS

Engineers and Manufacturers of Machinery for the Reduction of All Sorts of Dry Grindable Materials, Animal, Chemical, Mineral, and Vegetable, and Some that Carry 6% to 8% of Moisture, also of Powdered Coal Burning Equipment

**PRODUCTS:** Crushing, Granulating, Disintegrating, Pulverizing and Shredding Machinery; Dust Collectors; Air Vent Chambers; Stokers and Combustion Chambers for burning Powdered Coal, for Locomotives, Steamships, Stationary Boilers, Stills, Retorts, Kilns, Metallurgical Furnaces, etc.

**PIONEERS** in the art of pulverizing and stoking and burning Powdered Coal, under Boilers and some other Heating Units.

### STROUD POWDERED COAL STOKER AND BURNER

Receives the Powdered Coal, draws its own supply of Air from the atmosphere, measures the coal and the air as used, mixes them thoroughly, delivers the mixture to the furnace (where it ignites at once) and enables the operator to have complete control of furnace temperatures, and to make records from which to duplicate his results at will. We build also a Stoker for Locomotives.

Illustration is of our Left-Hand Stoker. We build Right-Hand as well.

Stoker can also be built for either upward or downward delivery.

Slide ————— to start and stop flow of coal

Pulley ————— or Electric Motor or Steam Turbine, as desired

Outlet ————— of Fuel Mixture



PATENTED

← The Coal Tank can be of other size and shape, or can be a metal barrel, if preferred

← Sprockets, Chain, Worm and Gear, which drive the Conveyor from spindle of fan, and automatically govern the supply of coal

← Air Inlet and Controller

All persons are warned that the ideas embodied in the "Stroud Powdered Coal Stoker and Burner" have been well covered by fundamental patents.

Sizes and Capacities from 15 lbs. to 5000 lbs. of coal per hour per stoker with all the air needed for combustion. Write for Bulletins, "A" and No. 107.

### CRUSHING AND GRANULATING ROLLER MILLS

With either pointed or chisel-shaped cutters, or fluted rollers, one pair, two pairs, or three pairs of rolls high, per mill. Ask for Bulletin "A."

### STROUD AIR SEPARATION PULVERIZERS

Our illustration shows a Product Collector attached to the Pulverizer. We build Air Vent Chambers, too.

These mills give a finished product direct which, without subsequent sieving, is so uniformly fine that 95% or 98% or all of it, as wanted, will, if tested when dry, pass through a horizontal brass wire cloth testing sieve of the desired mesh, which can be any mesh from, say, 40 x 40, down to the most impalpable powders, far finer than a 200 x 200 mesh. They are without exception the most efficient Pulverizers made. Dustless in operation. Difficult to clog. Easy to clean. A cool Pulverizer for chemicals. So automatic in feeding and operation that one man can attend half a dozen mills. Cost of milling very low. Ask for Bulletin No. 101.

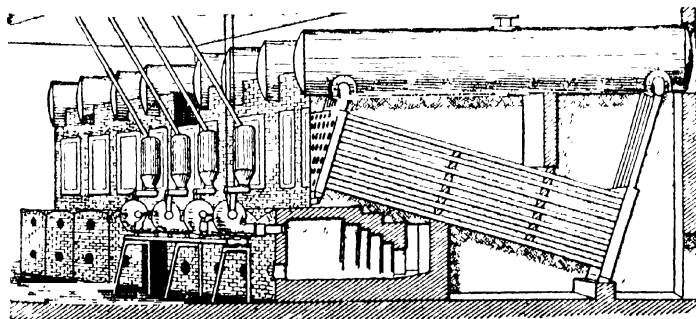


### THROW-OUT-BOX-END-DOOR

For cleansing materials from imperfect and foreign matter during process of pulverization. Ask for Bulletin No. 101-B.

### STROUD SCREEN SEPARATION CRUSHING AND GRINDING AND SHREDDING MILLS

Ask for Bulletin No. 102-B.



### ROUGH SKETCH OF A TYPICAL STROUD POWDERED COAL INSTALLATION

We have purposely made an incorrect drawing of the Furnace and some other details because we do not wish to advertise or give away gratis information which has cost us considerable time and money and effort.

Our installation is as simple as that shown, and gives entire satisfaction.

# THE A. W. STRAUB COMPANY

## The Quaker City Drug and Chemical Mills

FACTORY AND GENERAL OFFICES

3737-41 Filbert Street, PHILADELPHIA, PA.

### PRODUCTS

**Quaker City Drug and Chemical Mills; Hand, Power, and Electric.**

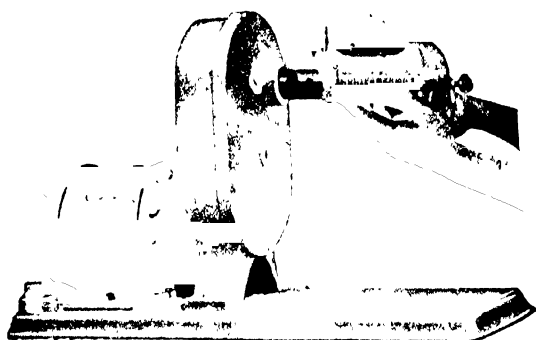
#### ELECTRIC LABORATORY GRINDING MILL

This direct motor-driven Laboratory Grinder is mounted together with the electric motor on a heavy, substantial base which eliminates all vibration while the mill is in operation. The gear connection between motor and mill is fully enclosed in the cast-iron stand supporting the mill at a height allowing a receptacle to be placed under the discharge opening.

A ball box bearing is provided at the extreme end of the grinding shaft to take up the thrust, thus insuring a very easy running mill and a consequent saving in power, wear and tear.

This grinder is equipped with interchangeable Grinding Units, a unique feature found on our direct motor-driven Laboratory Grinder exclusively.

The Grinding Unit, which is quickly and easily attached and detached from the driving mechanism, is furnished either for dry or wet grinding. The low cost of the Grinding Unit enables you to buy a number of



SHOWING EASE OF ATTACHING A COMPLETE GRINDING UNIT

these units and use each unit for a definite purpose only. Thus, you can have one unit for grinding food-stuffs, another for poisons, a third one for oily substances, an individual unit for each color, etc.

This Interchangeable Grinding Unit feature makes the mill a great labor and time saver in laboratories where many different substances are being ground and where the grinder has to be thoroughly cleaned with every change of material when only one grinder is available.

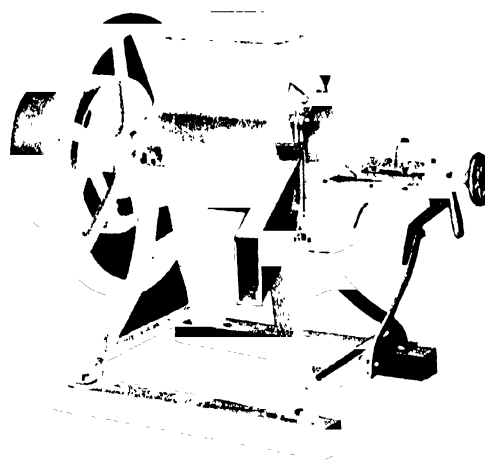
The dry grinding unit will successfully grind products such as: Barks, Roots, Seeds, Gums, Resins, Chemicals, Minerals, and Metals of all kinds.

The wet grinding unit, which is equipped with a different crusher and plate, will handle all sorts of wet and oily substances.

An extra set of grinding plates, Cutler-Hammer plug, button switch, porcelain plug receptacle and 12-ft. connector cord with a screw plug is furnished with this mill, ready to be connected to any lamp socket, either direct or alternating current as specified.

#### POWER DRUG AND CHEMICAL MILL

Our No. A-10 Power Drug and Chemical Mill is highly efficient in performance and so simple in construction that it does not require a mechanic to operate it.



POWER DRUG AND CHEMICAL MILL, NO. A-10

#### Specifications

Capacity: 300 to 700 pounds.

Speed: 200 to 400 r.p.m.

Power required: 3 to 5 H.P.

Floor space: 40" x 22".

Height of mill: 27".

Pulleys: Tight and loose, 14" x 5".

Weight: 400 pounds.

#### Use

This mill is being successfully used for the grinding of drugs, chemicals, minerals, and metals of all kinds in the chemical, drug, glass, paint, cement, food products, and other industries.

*Continued on Next Page*



**Other Mills**

produce mills of this general type of the capacities:

1000	pounds per hour		
600	"	"	"
150	"	"	"
350	"	"	"

**SMALL POWER DRUG AND CHEMICAL MILL**

No. G-6 $\frac{1}{2}$  Style C Power Drug and Chemical mill has a capacity of 50 to 100 pounds per hour. It occupies a floor space 26 x 14 inches, and is 18 inches high. It requires 1 $\frac{1}{2}$  to 2 horsepower and weighs 125 pounds.

We produce this mill both with and without delivery legs, and can recommend it highly for all branches of the chemical industry requiring a small capacity, efficient mill.

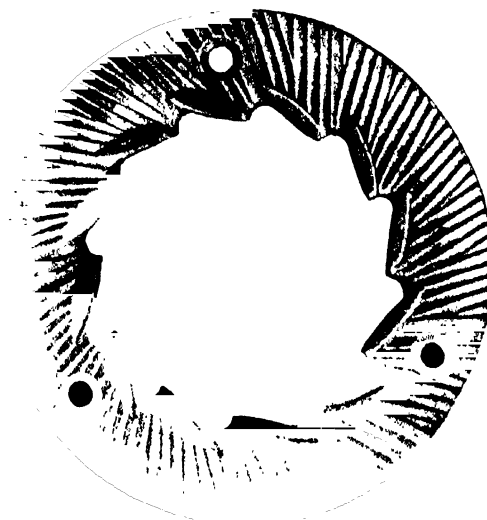
**CONSTRUCTION**

All Quaker City grinding mills are constructed of the best grade of materials. Each machine is mounted on a heavy, substantial base, which completely eliminates the vibration of the mill, when in action. The frame of each mill is built of heavy iron, making a strong, well-built machine for hard and constant use.

The journals are heavily babbitted with an anti-friction metal which wears for years without renewing. The shaft runs the complete length of the mill, with journal boxes properly placed, connecting directly with the source of power, thus eliminating the use of gears, which are the source of unending trouble. At the end of the shaft is a ball box bearing to take care of the thrust at the end of the spindle. The ball box bearing is separate and distinct from the machine. Not being cast with the mill parts, it can be, in case of breakage or wear, removed very readily and a new bearing substituted. This feature, together with the direct connection, reduces the friction and consumes less power.

The grinding plates of any mill, where the work is done, constitute practically the heart of the mill. Any heart disease here means more power consumption, less production, over-heating, or a poor, inferior and ununiform product. Tests made by us have long since proved that Quaker City grinding plates grind faster and truer with less power consumption than any other type or make. This is due to the construction of the plate, which is flat, and to the metal used; the latter being exceptionally hard and resisting wear for a long time.

While stones and hard substances should be removed from the material to be ground as thoroughly as possible, there are always some foreign substances remaining. A pebble passing into the mill and through the plates will be ground up so fine as to be entirely undetectable in the finished product, and without any injury whatever to the grinding plates.



QUAKER CITY GRINDING PLATE

Notice in the illustration above, that the tramming ring seat is provided with a slight concave corner which holds the tramming-ring to which the stationary plate is bolted, a sufficient distance away from the tramming-ring seat to permit a rocking action, a flexibility which prevents both the stationary, and the revolving plates from wearing unevenly, making a perfect grinding surface absolutely certain. Also, should any hard substance such as nails, tins, etc., pass through the plates, this flexibility permits them to pass without injury to the plate.

This feature is to be found on a Quaker City Mill only.

The plates wear extremely well— and when worn beyond a good grinding surface can be discarded, as new plates are supplied at a low cost, in fact, at a price far below the cost of cones. An extra set of plates is sent with each mill.

**GUARANTEE**

Quaker City Mills are sold on a positive guarantee. We will bill you in the regular way and allow you a ten-day trial of the mill at our expense. If it is not satisfactory, we want you to return the mill to us. Each part is guaranteed against defective workmanship and material for a period of one year.

Our half a century of grinding experience is back of each machine. Each mill must do its work right.

**SERVICE**

Our laboratories are prepared to test any product you have, and we shall be very glad to have you send us samples. We will grind them in any manner you desire, and submit them with our recommendations as to which mill will best do the degree of grinding desired.

Expert advice on any phase of grinding and pulverizing gladly given.

**USERS**

There are thousands of these mills doing service all over this and many foreign countries. Some of the largest drug and chemical manufacturers in the United States are using our mills with entire and continuous success.

# STRUTHERS-WELLS COMPANY

Steel Plate Construction: Riveted and Welded

WARREN, PENNSYLVANIA

Telephone 1-1

New York Office: 30 Church Street

Telephone 1-1

## PRODUCTS

A general line of steel plate construction made with riveted or welded seams, or shipped knocked down, including equipment for—

Acid Works	Chemical Works
Powder Plants	Soap Factories
Paper Mills	Paint and Varnish Works
Oil Refineries	Sugar Refineries
Wood Alcohol and Turpentine Plants	By-Product Coke Oven Plants

and for any industry using or handling articles manufactured of steel plate.

Tanks, for Storage, Pressure or Vacuum	
Filters	Still
Coolers	Retorts
Agitators	Condensers
Steam Pans	Riveted Pipe
Digestors	Jacketed Kettles

## WELDING

Done Electrically and by the Oxy Acetylene Process. Highest Efficiency.

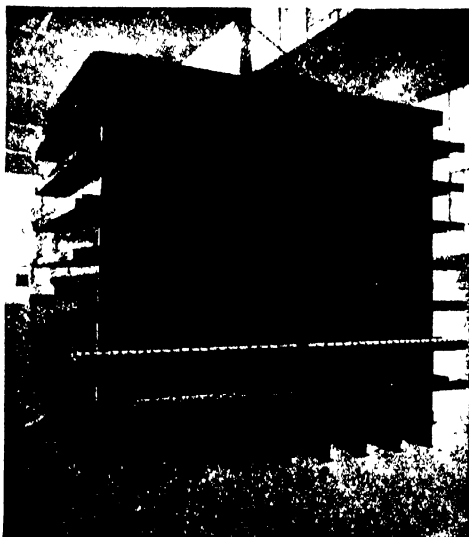
## WOOD ALCOHOL PLANTS

More than 90 per cent of the Wood Alcohol Plants in the United States and Canada have equipment made by us. Send for free booklet.

## GENERAL CATALOG SENT ON REQUEST

We estimate and quote on work of special character from purchaser's specifications.

We assist you in designing your work. Submit your problems.

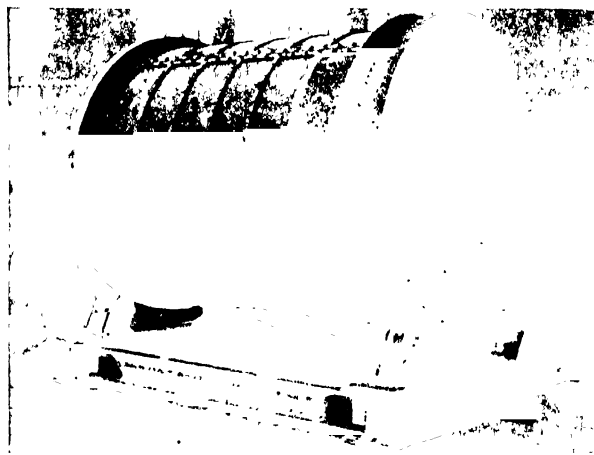


**RECTANGULAR VACUUM TANK**

A Rectangular Tank 17 feet long, 9 feet wide and 16 feet deep, with welded seams, braced on the outside with I beams to withstand 29 inches vacuum. In use as a Vacuum and Impregnating Tank. The cover is of cast iron, arched and braced for strength and hinged for opening and closing.

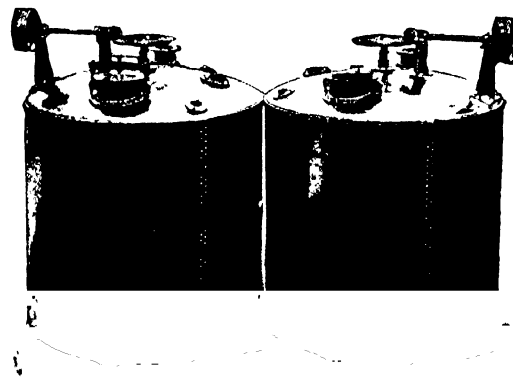
## FACILITIES

The plant, covering seven acres, is a complete unit within itself, having **Plate Fabricating Shop, Machine Shop, Foundry, Pattern Shop, Oxygen and Acetylene Generating Stations**, etc—all of modern construction and equipped with up-to-date tools and machinery. It is, therefore, independent of outside sources of supply, and a completed job can be accomplished from the incoming steel plates to the outgoing finished material. A competent **Engineering Department** is at the service of customers, as is, also, the experience of nearly seventy years in the business. The Foundry furnishes gray-iron and semi-steel castings up to 15 tons each. The Machine Shop tools include a boring mill with a swing of 13 ft., while the tools of the Plate Shop include hydraulic riveters up to 16 ft. throat. Other equipment in proportion.



**ROTARY DRUM**

A Revolving Cylinder 6 feet in diameter by 8 feet long. The shell is of perforated plate, removable in sections, bolted in place and supported by a framework of shapes and bars. A complicated piece of construction requiring accurate and careful workmanship throughout.



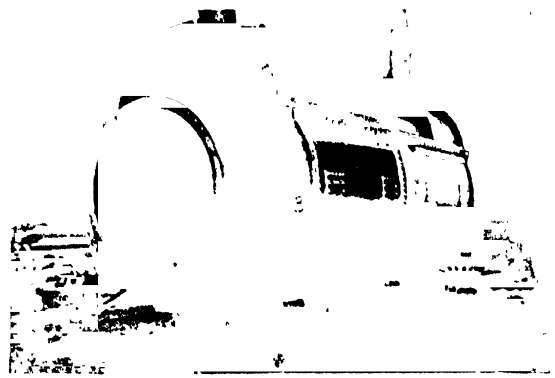
**MIXING TANKS WITH AGITATORS**

Two Tanks, each 8 feet in diameter by 8 feet high, with mixing apparatus and driving gears. Tanks similar to these in construction can be steam jacketed or equipped with steam coils.

*Continued on Next Page*

**RECTANGULAR OVEN RETORT**

Used in the distillation of hard woods. These retorts may be had in any length from 32 ft. to 56 ft.

**A SPECIAL TYPE OF SURFACE CONDENSER**

This condenser is 7 feet by 14 feet. Access is gained to the interior for cleaning through the removable side sections of the shell.

**TUBULAR HEATERS**

In various stages of construction. These can be made with either riveted or welded joints. Note also the large tank on the left and the door of an impregnating tank on the right.

**STORAGE TANKS FOR OXYGEN**

Four Pressure Tanks, 5 feet diameter, 35 feet long, for the storage of oxygen under 300 pounds pressure per square inch. These tanks were subjected to a test pressure of 450 pounds per square inch and were designed with an ample factor of safety. They are an example of thoroughly high grade riveted work.

**CREOSOTING CYLINDER**

6 ft. 2 ins. diameter, 106 ft. long, tested to 375 lbs. per sq. in.  
Also a miscellaneous assortment of steel plate work.

# THE STUART & PETERSON COMPANY

Plain and Porcelain Lined Cast Iron Chemical Equipment

BURLINGTON, N. J.

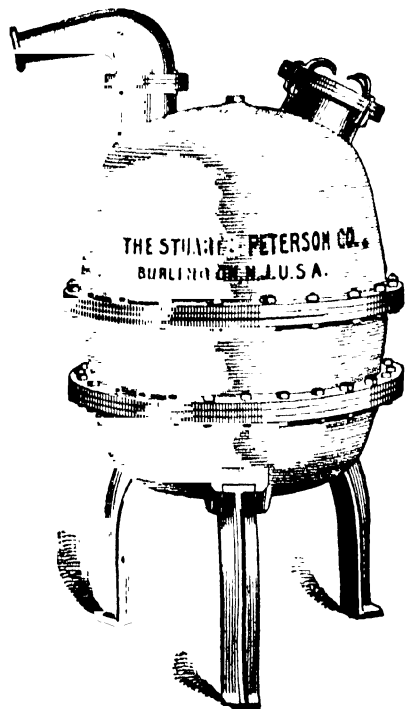
## PRODUCTS

Enameled and Plain Cast Iron Chemical Equipment, including:

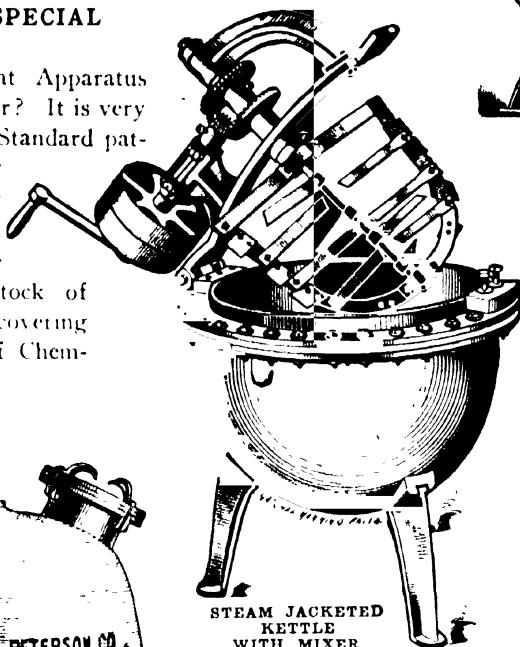
Autoclaves	Pans
Caldrons	Percolators
Emulsifiers	Retorts
Evaporating Dishes	Specialties
Gates (Faucets)	Sterilizers
Kettles	Stills
Jacketed	Nitrating
Mixing	Vacuum
Plain	Stirrers
Tilting	Storage Cans
Mixers	Sulphonators
	Tanks

## STANDARD AND SPECIAL EQUIPMENT

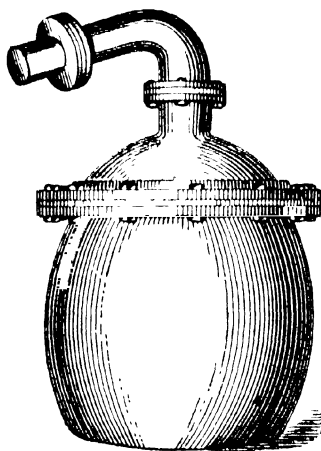
Are you sure that Apparatus must be Built to Order? It is very probable one of our Standard patterns may Solve your problem—at a very appreciable saving. Since 1840 we have assembled a vast stock of standard patterns covering almost every type of Chemical apparatus.



GOLDEN CROWN STILL



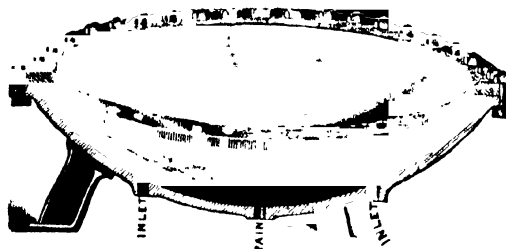
STEAM JACKETED KETTLE WITH MIXER



SUN STILL



PORCELAIN LINED EVAPORATING DISH



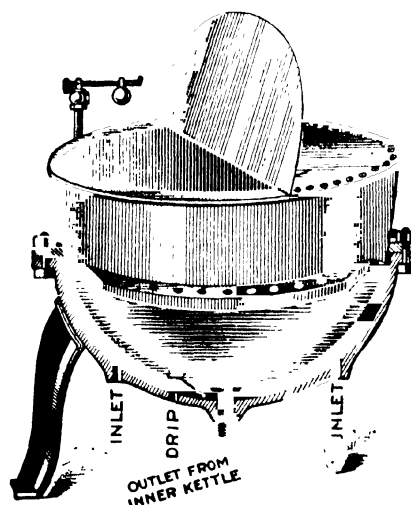
STEAM JACKETED EVAPORATING DISH

Stuart & Peterson equipment is known the world over for highest quality in design, workmanship and materials.

Standard equipment cannot always be adapted to conditions. In these cases our staff of skilled chemical and mechanical engineers will, after a careful study of requirements, design equipment that will fulfil the special requirements.

We also build to purchasers' plans and specifications.

If you cook, boil, evaporate or distil, our catalog should be in your possession. Write for it today.



STEAM JACKETED KETTLE WITH COVER

# G. L. STUEBNER

Manufacturer of

Hoisting Buckets, Dump Cars and Melting Furnaces for Contractors' Service

Cor. Hancock Street and Vernon Ave.

LONG ISLAND CITY, N. Y.

Telephone  
HUNTER'S POINT 0039

## PRODUCTS

Turnover and Bottom Discharge Buckets; Steel Skips; Small Platform, End, Side and Bottom Dump Cars.

Also, Push Carts, Asphalt Melters, Pipe Line Lead Melting Furnaces, etc.

## STANDARD SELF-DUMPING AND SELF-RIGHTING BUCKETS

Made in classes "A" and "B." Designed for use with stone, sand, clay, concrete, and materials of a similar nature.

**Class "A"**—Top of bucket is from eight to ten inches wider than the bottom, permitting the bucket to be quickly filled and rapidly dumped in a clean manner. Easily handled and well adapted for sinking shafts, sewer work and similar operations.

**Class "B"**—Similar to class "A," except that the sides are straight, of equal width top and bottom. This bucket is nicely balanced, has double bottom,

strong bail, trunnions, reliable latch, also, weighs and costs less than class "A." See illustrations of various types of buckets made by G. L. Stuebner.

**"Controllable" Central Discharge Bucket**—Used for depositing materials into smallest as well as largest equipment. Provided with patent pin-controlling device, to regulate width of discharge opening, and with powerful levers for controlling quantity of concrete running out.

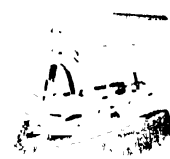
**"Excelsior" and "Invincible" Bottom Dump Buckets**—Particularly adapted to handle concrete, mud, clay, sand, rock and similar materials. Quick-acting, clean, dumping and labor-saving buckets.

## DUMP CARS, PUSH CARTS AND MELTING FURNACES

Strongly built of best materials, in various types and sizes, for severe service. See illustrations.



End Dump



Side Dump

DUMP CARS



"Invincible"  
Bottom Dump  
(Patented)



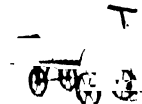
Self-Dumping  
and Self-Righting  
Turnover Type



"Excelsior" Bottom  
Dump  
(Patented)



PUSH CARTS



BOILER ROOM  
CHARGING  
WAGON



"Pin-Controllable"  
Central Discharge  
Pier Bucket  
(Patented)



"Controllable"  
Central Dis-  
charge  
(Patented)



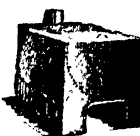
Two-Line Bottom  
Dump  
(Patented)



STATIONARY  
LEAD MELTING  
FURNACE



PORTABLE TAR MELTING BOILERS



STATIONARY  
TAR MELTING  
FURNACE



Round Type



Side- and Back-Lever Catch for Coal Hoisting



STUEBNER HOISTING BUCKETS

## CAPACITIES, DIMENSIONS AND PRICES

Quoted upon application.

## CATALOG

Write for catalog and further information.



# THE STUPAKOFF LABORATORIES

Established 1895

Hamilton and Fifth Avenues  
PITTSBURGH, PA

## PRODUCTS

The principal articles of manufacture of the Stupakoff Laboratories are:

**Thermo-Electric Pyrometers, Precision Instruments, and Usalite—Pyrometer insulating and protection tubes.**

Only a few of our products are illustrated herewith. If further interested write for descriptive catalogs.

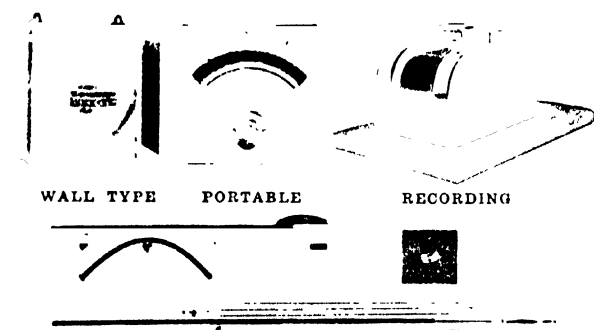
## THERMO-ELECTRIC PYROMETERS

Thermo-electric pyrometers are of most extensive use in all chemical, metallurgical, glass and other ceramic industries, for the measurement of all temperatures from absolute zero to 3000 deg. F.

Simply constructed, readily handled, easily understood by ordinary workmen.

Adapted to the most varied requirements up to 3000 F., above which Optical or Radiation Pyrometers must be supplied.

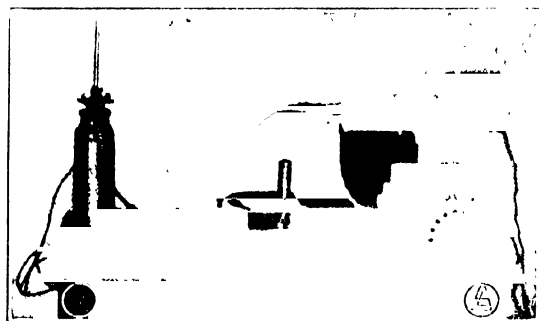
Where it is essential to obtain accurate temperature measurement, much thought must be given to every detail in the construction of the apparatus, combined with a knowledge of the field to which it is applied. We have specialized in the field of pyrometry for 25 years.



WALL TYPE PORTABLE RECORDING

## INSPECTORS' PORTABLE PYROMETER OUTFIT

With universal joint tripod for galvanometer and right angled curved Usalite tube.



LABORATORY PYROMETER OUTFIT

Electric Furnace, Rheostat, Galvanometer, Thermo couple, Thermos bottle with Cold Junction Couples

## USALITE

"Usalite" is a highly refractory porcelain coated with a hard glaze, impermeable to gases at very high temperatures.

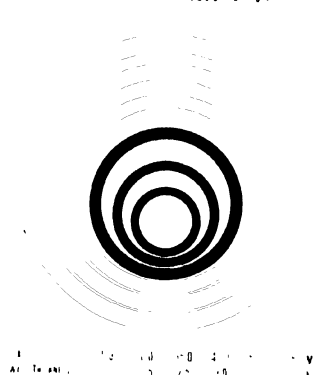
This product is the result of very extensive experimenting to produce a superior Pyrometer Tube, based on our knowledge of, and especially made to meet all requirements of the manufacturing industries.

## USALITE HIGH TEMPERATURE PORCELAIN PRODUCTS

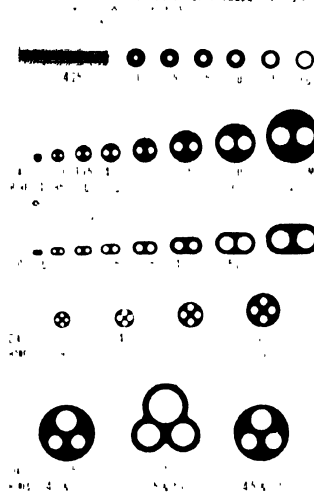
It is very important to thoroughly protect the thermo couple wires—to have them always maintain their original physical and chemical properties. A change in the original properties of the thermo couple results in incorrect temperature indications, which are usually serious and costly. Usalite Pyrometer Tubes are built to protect the thermo couples,—and do.

The Stupakoff Laboratories specialize in making tubes for the protection and insulation of thermo couple wires.

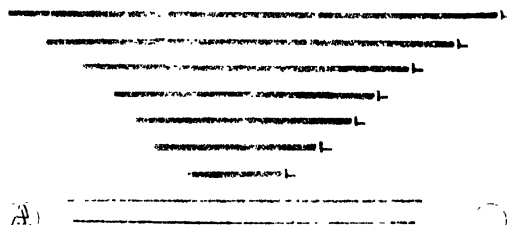
STANDARD USALITE TUBES 1-5



CYLINDRICAL, FLAT AND CLOVER LEAF TUBES 5-50



STANDARD "USALITE" TUBES



"USALITE" PYROMETER TUBES

Inquiries for other articles of this material solicited.

Over 300 sizes carried in stock.

ASK FOR CATALOG

# B. F. STURTEVANT CO.

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Cincinnati, Ohio  
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Hartford, Conn.  
Los Angeles, Cal.  
Minneapolis, Minn.



**Sturtevant**  
PUTS AIR TO WORK

BRANCHES IN FOLLOWING CITIES

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Rochester, N. Y.  
St. Louis, Mo.

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San Francisco, Cal.  
Seattle, Wash.  
Toronto, Ont.  
Washington, D. C.

## PRODUCTS

### Heating and Ventilating Equipment:

Multivane Volume Blowers and Exhausters  
Propeller and Disc Type Volume Exhaust Fans

### Heaters

Air Washers

Engines and Motors

### Galvanized Duct Work

Portable Ventilating Sets

### Power House Equipment:

Steam Engines

Steam Turbines

Fuel Economizers

Mechanical Draft Apparatus

Turbine, Steam Engine

and Gasoline Electric

Generating Sets

Generator Coolers

Transmission Gears

### Air Conditioning Equipment:

Paper, Glue, Wood and Leather Drying and Vapor Absorption Systems

Air Washing, Humidifying and Dust Removing Systems

Dehumidifying Systems

### Industrial Equipment:

High, Medium and Low Pressure Blowers

Volume Blowers

Planing Mill Exhausters

Cupola Blowers

Gas Blowers and Boosters

Gas Exhausters

Acidproof Fans

Steam Exhaust Heads

Forges and Forge Blowers

Pneumatic Collecting and Conveying Systems

## ENGINEERING SERVICE

As each installation is unique, it is usually necessary that an engineer analyze the conditions before making recommendation.

The engineering staff of the B. F. Sturtevant Company has been trained to analyze all conditions and to properly apply the company's apparatus accordingly.

Consult this department, which is at the disposal of engineers and others without obligation.

## PUBLICATIONS

The Sturtevant line is so varied that a comprehensive presentation in one publication is undesirable. This company has, therefore, issued a special bulletin on each particular line covering the mechanical details.

## CATALOGS

### Drying Apparatus

243. Paper Drying

### Heating and Ventilating

271. Multivane Fans

238. Multivane Fans; Performance Charts

230. Heaters

227. Heating and Ventilating Layouts, Blue Print Book

201. Electric Dust Blowing Sets

237. Ready-To-Run Ventilating Sets

1011. Heating and Ventilating Factories

1012. Heating and Ventilating Schools

1013. Heating and Ventilating Public Buildings

1015. Heating and Ventilating, Book Complete

### Mechanical Draft

236. Forced Draft Fans

276. Turbo Undergrate Blowers, Design 5

256. Steam Turbines

217. D. C. Type "D" Motors

239. Vertical Engines

### Vacuum Cleaners

244. Stationary Vacuum Cleaners

248. Architects' Hand Book

### Planing Mill Fans and Dust Conveying Systems

185. Slow Speed, Low Power Planing Mill Exhauster

233. Slow Speed, Low Power Reversible and Convertible Planing Mill Exhauster, Design 6

261. Pneumatic Dust Collecting and Conveying Systems

234. Steel Plate Blowers and Exhausters

252. Steel Plate Fan, Performance Charts

### Power Apparatus

239. Vertical Single Cylinder Steam Engines

256. Steam Turbines

264. Electrical Apparatus

217. Type "D" D. C. Motors

239. Steam Engine Generating Sets

255. Gasoline Electric Generating Sets

256. Steam Turbine Generating Sets

150. Fuel Economizers

223. Fuel Economizers in Textile Mills

### Pressure Apparatus

257. Positive Pressure Blowers

258. Design 4 and 5 Pressure Blowers

265. Steel Pressure Blowers

242. Monogram Blowers and Exhausters

### Miscellaneous

195. General Catalog

250. Architects' and Engineers' Data Book. Carefully prepared, giving full technical information usually required. Contains 960 pages of invaluable information covering heating and ventilating. Price \$10.00.

# STURTEVANT MILL COMPANY

OFFICES AND WORKS

Harrison Square, BOSTON, MASS.

LONDON, F. C.  
147 Queen Victoria St.NEW YORK  
Singer Bldg.  
Cable Address: "EMERYSTONE," BostonCHICAGO  
Peoples Gas BldgPITTSBURGH  
First National Bank Bldg  
Lieber, Western Union and Private CodesATLANTA  
Healey BldgDENVER  
Colorado Bldg

## PRODUCTS

Crushing, Pulverizing, Grinding, Screening, Sampling, Elevating, Conveying and Mixing Machinery, also complete Plants (using above types of machinery) Designed, Equipped, Supervised, Erected and Operated.

## CRUSHERS

**Jaw Type** For Coarse, Intermediate and Fine Crushing, Plate Steel, Cast Steel and Cast Iron construction. Blake, Dodge and Cam and Roll actions. Sizes: 2" x 6" to 12" x 26".

**Rotary Type** For the fine reduction of soft and moderately hard materials, such as Lime, Gypsum, Tale, Soapstone, Clay, Coal, Caustic Soda, Salt, etc. Open Door, accessible construction, Hand Wheel adjustment. Crushers from 8" to 14" or coarser if desired.



CIRCULAR NO. 62



CIRCULAR NO. 63

### SPECIFICATIONS ROTARY TYPE CRUSHERS

No.	00	0	1	1 1/2	2
Hopper Opening in Inches	6 x 18	9 x 18	6 x 19	10 x 28	19 x 30
Approx. Capacity Tons per Hour	1 1/2	1 1/2	2 1/4	5 1/2	8 1/2
Approximate Horse Power	1 1/2	4 1/4	6 1/2	15	20
Speed R.P.M.	400	250	300	300	250
Pulley	12 x 4	18 x 6	24 x 8	30 x 10	30 x 12
Length	3' 9"	4' 7"	6' 4"	7' 4"	8' 8"
Width	2' 5"	2' 4"	3' 6"	3' 6"	3' 10"
Height	3' 5"	3' 7"	5'	6'	7' 1"
Approximate Net Weight Lbs	900	1300	4000	6000	9000
Approx. Gross Weight Lbs	1050	1600	4700	7000	10500

Smallest dimension given means large if CUBES the crusher will take.

\*These approximate dimensions do not mean the size rock the machine can grip.  
\*\*Capacities based on 14" setting and will necessarily vary according to material being crushed, its friability, specific gravity, moisture content and size of feed.

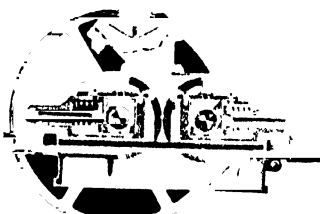
## ROLLS

For Crushing, Granulating and Pulverizing. Balanced construction. Springs back of all four bearings give instant relief under breaking pressures. Shocks quartered. Automatic adjustments. Sizes 8" x 5" to 38" x 16".

## PULVERIZERS

Swing-Sledge, and Hinged-Hammer for pulverizing soft and moderately hard materials such as Limestone, Lime, Shells, Chemicals, Tale, Clay, Chalk, Bark, Rosin, Sulphur, Salt, Coal, Tankage, Fish, etc.

Range of output from 1" to 20 mesh and finer.



CIRCULAR NO. 65



CIRCULAR NO. 84

## RING-ROLL MILLS

For grinding hard, medium or soft materials from 2" to from 10 to 100 mesh. For grinding cement-clinker, limestone, ores, granite, trap, phosphate, clay, shale, iron-borings, feldspar, etc. Slow-speed, durable and accessible. No internal screens. Large capacity per horse-power and low upkeep. Five sizes. Capacities from 1 to 25 tons per hour.



CIRCULAR NO. 79

## EMERY MILLS

For the fine grinding of Tale, Soapstone, Gypsum, Lime, Facings, Colors, Graphite, Clay, Shale, Coal and most soft and moderately hard substances to a fine powder without the use of screens.



CIRCULAR NO. 64

## LABORATORY CRUSHERS

For crushing any Rock or Ore from 1" to 3" size to cracked corn size and finer. Easy to clean, require from 1 to 2 h.p. Capacities from 100 to 600 lbs. per hour. Two sizes, jaw openings, 2" x 4" and 2" x 6". Also larger sizes, 4" x 8" and 5" x 10".

Used extensively in laboratories, assayers' offices, mining schools, steel mills, etc.



CIRCULAR NO. 67

### SPECIFICATIONS LABORATORY ROLL JAW FINE CRUSHERS

Jaw Opening Inches	2 x 6
Approx. Capacity Per Hour	250 to 350 lbs.
Jaws Set to 1/4 inch	350 to 600 lbs.
Jaws Set to 1/2 inch	600 lbs.
Approx. Horse Power	1
Speed R.P.M.	350
Pulley Inches	18 x 3 1/2
Length Over All	2' 9 1/2"
Width Over All	1' 10"
Height Over All	1' 10"
Approx. Weight Heaviest Piece	400 lbs.
Approx. Net Weight	900 lbs.
Approx. Gross Weight	1000 lbs.

## LABORATORY CRUSHING ROLLS

Crush hard or soft rocks and ores from 1/2" to 8 mesh or even as fine as 40 mesh. Usually installed to reduce crusher outputs finer. Two sizes, 8" x 5" and 12" x 12". Capacities from 200 lbs to 1 ton per hour. Immediately accessible for cleaning. Automatic adjustments.



CIRCULAR NO. 67

### SPECIFICATIONS LABORATORY CRUSHING ROLLS

Size In.	Pulley In.	Speed R.P.M.	Approx. Horse Power	Approx. Length	Approx. Width	Approx. Height	Approx. Net Weight lbs.	Approx. Gross Weight lbs.
8 x 5	18 x 4	150	1	33"	20"	22"	650	700
12 x 12	36 x 6	150	3 to 4	4'	4' 8"	3' 2"	3000	3500

Continued on Next Page



**SAMPLE GRINDERS**

For the fine grinding of rock and ore samples. Pulverizes to 80 or 100 mesh or coarser. Open door construction for accessibility and thorough cleaning. Capacity from 50 to 200 lbs per hour. Power, 3 hp.



CIRCULAR NO. 67

**SPECIFICATIONS LABORATORY SAMPLE GRINDERS**

Size	Grinding Plate Diameter	Approx Length	Approx Width	Approx Height	Approx Horse Power	Pulley	Speed R P M	Approx Net Weight lbs	Gross
No 2	10"	32"	16"	14 1/2"	1	7 x 3	750	175	200
No 0	6"	30"	12"	11 1/4"	2	6 x 2 1/4	1200	150	175

**AUTOMATIC COAL CRUSHER AND SAMPLER**

For crushing and automatically sampling coal preparatory to analysis. Takes coal 3" in size, crushes it to 1/4" and finer, and at the same time automatically removes 5, 10, or 15% of the amount passing through. This sample is an accurate representation of the whole and is ready for the chemist to analyze. Used by large power plants which buy coal on a B T U basis.



CIRCULAR NO. 85

**SPECIFICATIONS AUTOMATIC COAL CRUSHER AND SAMPLER**

No.	Hopper Opening	Approx Cap. Coal Tons per Hour	Approx Horse Power	Speed R P M	Pulley	Length	Width	Height	Approx weight lbs
No.	6" x 18"	1 to 1 1/2	1 to 2	900	12 x 4	3' 9"	2' 4 1/2"	3' 5"	900
									1050

**WITH MOTOR**

No.	6" x 18"	1 to 1 1/2	1 to 2			3' 9"	2' 4 1/2"	3' 5"	1300	1500
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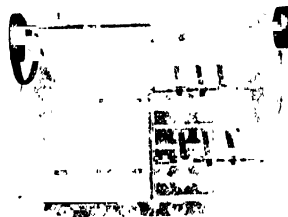
**SCREENS**

**Sturtevant-Newaygo Super-Screen**—For screening everything screenable, from 1/2" to 180 mesh. An inclined vibrating Screen of Unit Construction.

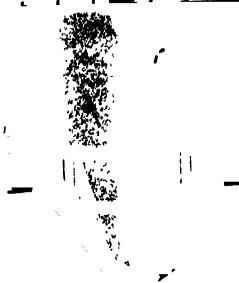
Screen frames set at 45° angle. Automatically stretched clothing, vibrated by series of hammer blows upon elastic steel bridges, placed above wire cloth and forming part of the screen frame. Nothing comes in contact with the wire cloth except material being screened.

**AIR SEPARATORS**

For separating Mill Products. Built in many sizes. For 60 mesh or finer work.



CIRCULAR NO. 77



CIRCULAR NO. 87

**DRY MIXERS**

For mixing fertilizer and other dry ingredients in batches from 1/4 to 1 ton. Capacities from 4 to 30 tons per hour.

A simple and durable machine that accomplishes a thorough and rapid mixing.



CIRCULAR NO. 80

**SPECIFICATIONS DRY MIXERS**

Size Batch	1/4 ton	1 ton
Drum Capacity	25 cu ft	116 cu ft
Height with Hopper	8' 0"	12' 0"
Length with Hopper	7' 6"	12' 0"
Height without Hopper	5' 0"	7' 1"
Length without Hopper	5' 4 1/2"	7' 7 1/2"
Width	3' 0"	8' 4"
Pulley	24 x 4	36 x 8
Speed	120	75
Power	3 to 5	5 to 10
Capacity Tons per Hr	4 to 5	20 to 30
Weight		
With Hopper	2000	7840
Without Hopper	2000	7000

**"OPEN-DOOR" STEEL ELEVATORS**

"Open-Door" elevators for use with crushing, grinding and screening machinery or for many other purposes. "Open door" construction insures instant accessibility for cleaning, adjustment and repair. Dustless and fireproof, of strong, rugged design, and of ample proportions to withstand hard and constant use. Removable sections, split head, automatic take ups, etc.

**COMPLETE UNITS**

Ready to erect. Consisting of above or similar machinery, with all connections, transmissions, bins, valves, etc.

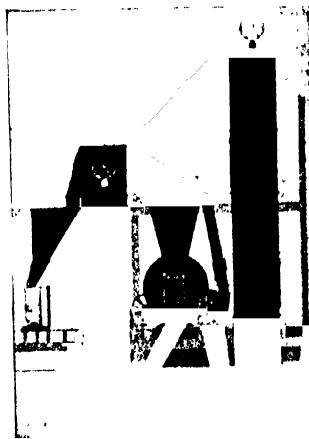
CIRCULAR NO. 61

**COMPLETE FERTILIZER PLANT UNITS**

For Grinding Rock, Tankage, Bone, Etc. For Mixing, Shipping, Unloading, and Handling.

Consists of elevators, mixer, pulverizer, screen, scales, chutes, feeders—complete, ready to set up. All-steel construction, practically dustless and fireproof.

All parts are designed to allow instant accessibility for cleaning.



CIRCULAR No. 86

**AUXILIARIES**

Chutes, Spouts, Bins, Hoppers, Feeders, Valves, Scales, Connections, Transmission, Etc.



CIRCULAR No. 61



CIRCULAR No. 61

# SULLIVAN MACHINERY COMPANY

121 South Michigan Avenue  
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Mexico City

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Seattle  
Spokane  
St. Louis

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Sydney, N. S. W.  
Tokyo  
Toronto  
Yokohama  
Yunis  
Yurin  
Yanconver

## PRODUCTS

Air lift pumping systems for acids, chemical solutions, well water supply, etc.; Air Compressors, Mining and Quarrying Machinery; Rock Drills, Hammer Drills; Dry Vacuum Pumps; Gasoline Extraction Compressors.

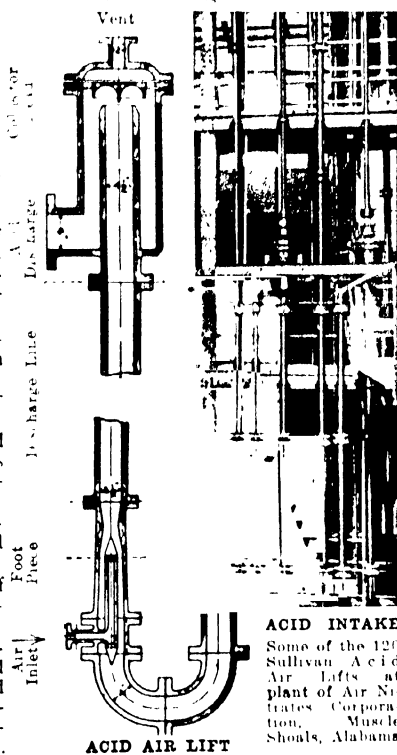
## AIR LIFT PUMPING SYSTEM

The Air Lift Department of this Company consists of a corps of engineers whose experience in solving problems of pneumatic pumping covers a range of twenty-eight years of manufacture and installation. Correspondence is solicited. Catalog 71D.

### General Advantages:

The general advantages of air lift pumping are:

1. Simplicity and durability, no moving parts in the liquid.
2. Any number of pumps controlled from one central power plant.
3. Economy of power secured on high lifts by compound or stage pumping.
4. Liquids carried horizontally as well as vertically.
5. Pumps are not affected by mud or sand.
6. Temperature of water is reduced.
7. Impurities readily removed and water rendered more susceptible to "softening" treatment.



**ACID INTAKE**  
Some of the 120 Sullivan Acid Air Lifts at plant of Air Nitrates Corporation, Muscle Shoals, Alabama

### Advantages for Acid Pumping:

1. **Durability**—The foot pieces and separator heads may be made of any desired acid resisting material, such as hard or soft lead, rubber, cast iron or cast steel, "duriron," etc. There are no moving parts to cause wear, and the free open passage characteristic of this apparatus secures a much longer life than that enjoyed by mechanical pumps.
2. **Flexibility**—The normal delivery may be increased as much as twenty-five per cent. or decreased by the same amount with very little change in operating efficiency, by the movement of a valve controlling the air supply.
3. **Submergence**—The air-lift is usually thought of as suitable only for deep wells, but with improved apparatus, and careful engineering, excellent results in overall efficiency are being shown on relatively low submergences. In cases not permitting wells or holes to be drilled to secure the necessary submergence, the compound lift may be employed. (See illustration above.)
4. **Central Power Supply**—The air-lift foot pieces or jets may be located at any desired point in the plant and operated by air from a central station with little loss in friction and no loss such as that of condensation or drop in power, as is experienced with steam or electric transmission. The tower men readily control the volume pumped from each unit, as well as the starting or stopping of it, by means of air valves.

5. **Efficiency**—The equipment and system employed by this company in its air lift apparatus secures the thorough mixing of the air and the fluid to be raised, by means of a large number of fine jets of air, discharging into a thin sheet of the fluid. While its efficiency may be exceeded by mechanical pumps under test conditions, it is found, in actual practice, that the air lift maintains its efficiency at a higher point, after a short period of operation.

6. **Safety**—The separator head furnished by this company conveys away the fumes or air impregnated by the acid, so that the employees are not exposed to this dangerous element.

If interested in pumps for handling brine, acid or other chemical solutions, send us the following information:

1. Temperature of liquid
2. Specific gravity of liquid
3. Material of which the pump should be made
4. Kind of acid or solution to be pumped
5. Lift in feet
6. Submergence in feet
7. Pounds per minute to be pumped

## DISPLACEMENT PUMPS

Displacement pumps are also available, when low submergence renders this method of handling liquids by compressed air desirable.

An important feature of these Sullivan pumps is the automatic control, so arranged that working parts do not come in contact with the liquid being pumped.

## AIR COMPRESSORS

Sullivan Air Compressors, for operating air lift and for other power supply purposes, are available in capacities ranging from 50 to 3000 cu. ft., and in many standard patterns. Two of the most popular are shown here. Ask for general booklet No. 121.



**WJ-3 ANGLE COMPOUND COMPRESSOR**

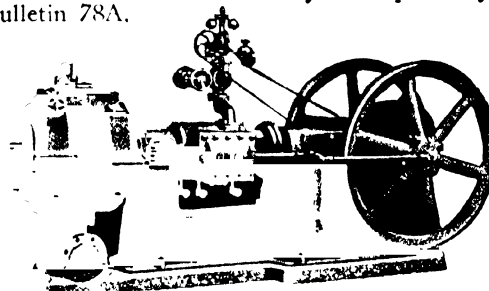


**WG-6 SINGLE STAGE BELTED COMPRESSOR**

## SULLIVAN DRY VACUUM PUMPS

Sullivan steam- and belt-driven dry vacuum pumps are available in a number of convenient sizes. They are equipped with Sullivan Wafer Valves on the vacuum cylinders, and all main working parts are fully enclosed and are lubricated by the splash system.

Bulletin 78A.



**SULLIVAN "WA-61" VACUUM PUMP**



**SULLIVAN AIR LIFT PUMP WITH UMBRELLA SEPARATOR FOR WATER PUMPING**

# THE SUPERHEATER CO.

Designing Engineers and Manufacturers of Elesco Steam Superheaters  
and Pipe Coils for All Purposes

GENERAL OFFICES: 17 EAST 42ND ST., NEW YORK, N. Y.

Chicago, Peoples Gas Bldg. Pittsburgh, Oliver Bldg.

## PRODUCTS

"Elesco" Superheaters for all types and sizes of Stationary Boilers; separately fired superheaters for all purposes; superheaters for locomotives and steam shovels; superheaters for marine service: Pipe coils for all purposes.

## ENGINEERING SERVICE

The Engineering Department of this company is at the service of those interested in the advantages or application of Superheated Steam.

## ELESCO SUPERHEATERS

Elesco Superheaters are suitable for all types of boilers without changes to the boiler setting. They

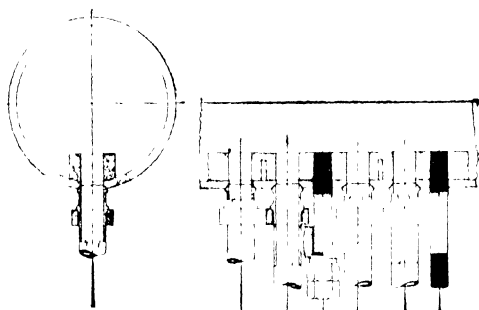


FIG. 1—BALL JOINT CONNECTION BETWEEN UNITS AND HEADER

reduce fuel consumption, increase boiler efficiency, reduce condensation in steam lines, reduce steam consumption in engines and turbines, increase the capacity of the plant.

Their design and construction provides freedom from leaks, ease of application, and accessibility for inspection and repairs, and maximum length of service without renewal.

The Elesco Superheater consists in general of two headers, one acting as the distributor for the saturated steam, coming from the boiler, and the other as a "Superheated" header for collecting the steam after it

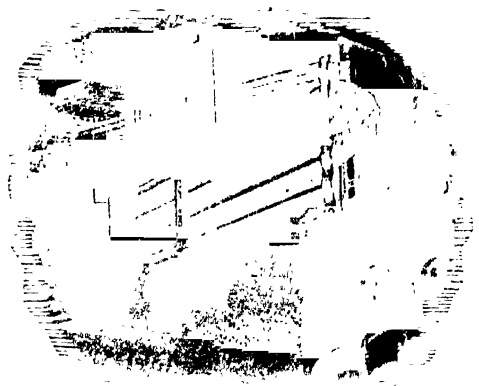


FIG. 2—TYPICAL INSTALLATION ELESCO SUPERHEATER

has been superheated, and the necessary connecting units in which the actual superheating takes place. The headers are made of steel and located out of the path of the hot gases, and in most cases, outside of the boiler setting proper, affording easy access for inspection and cleaning.

Units are of heavy cold drawn seamless steel tubing located in the advantageous gas temperatures, giving a large ratio of superheating surface, an even distribution to the flow of the gases, and a proper distribution to the steam through the superheater. The units present a smooth surface to the gases, tending to prevent an accumulation of soot and ashes, and are thus easily cleaned. Because of their small diameter and proper distribution they offer a minimum obstruction to the gases.

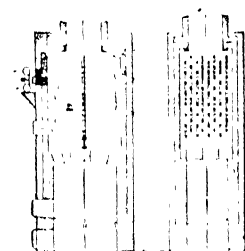


FIG. 3—SEPARATELY FIRED SUPERHEATER

A metal to metal ball joint forms the connection between the units and the headers, giving a positive tight joint, and avoids the use of hand holes and gaskets.

## SEPARATELY FIRED SUPERHEATERS

This company designs and manufactures separately fired superheaters, for all purposes and for process work, for pressures from atmospheric up to 1000 lbs. per sq. in. and for temperatures up to 1000° F. The special features of accessibility, regulation, long life and high efficiency are incorporated in these designs.

## SUPERHEATERS FOR STEAM SHOVELS

Elesco Superheaters, easily installed in steam shovels, reduce fuel consumption at least 25%. At least as high a saving in water is also possible.

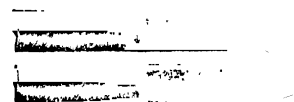


FIG. 4—SECTIONAL VIEW OF PATENTED FORGED RETURN BEND

## ELESCO PIPE COILS

The coils are designed and manufactured to practically any specifications, for any purpose. The feature of these coils involving a return bend is the patented forged return bend which results in a coil of practically a continuous pipe, without threaded or acetylene welded joints; greatest surface within a given space possible; absolutely leak proof.

Full Descriptive Literature on all "Elesco" Products.

# THE SURFACE COMBUSTION COMPANY

Industrial Furnace Engineers and Manufacturers

**THE SURFACE  
COMBUSTION CO.**

GENERAL OFFICES AND WORKS  
366-368 Gerard Ave., Bronx  
NEW YORK, N. Y.

**THE SURFACE  
COMBUSTION CO.**

Philadelphia - 611 Penn. Eyewitness Building

BRANCH OFFICES  
Pittsburgh - Union Arcade

Chicago - 395 South La Salle Street

## PRODUCTS

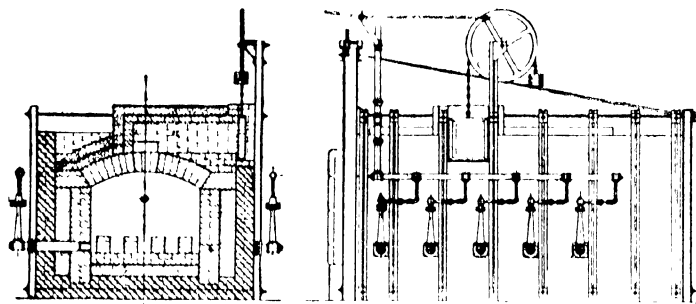
Surface Combustion Apparatus, Ratiometers, for all Types of Industrial Furnaces and Heating Equipment consuming gas or oil as fuel.

### MEDAL OF MERIT

Edward Longstreth Medal of Merit awarded by Franklin Institute for the Surface Combustion Gas and Air Proportioning System.

### APPLICATIONS

Surface Combustion is the ideal method of heating based on a thorough study of the fundamental and theoretical principles of combustion and carried into effect by the design of efficient and economical apparatus for the purpose. The process and apparatus are fully covered by U. S. Letters Patents and applications for U. S. Letter Patents.



SURFACE COMBUSTION VITREOUS ENAMELING FURNACE  
Intermittent Type

Some of the purposes to which Surface Combustion has been applied are furnaces for melting metals, oil stills, varnish boiling, annealing ovens, furnaces for the heat treatment of steel, for calibrating pyrometers, for galvanizing, welding, roasting, kilns, shipyard furnaces, glass melting and annealing furnaces, gun heat treating furnaces, carbonizing furnaces, asphalt heating, oil tempering furnaces, etc.

### SOME USERS

Among some of the well-known companies using our equipment might be mentioned

E. I. du Pont de Nemours Co.	Standard Oil Co.
General Electric Co.	Babcock & Wilcox Co.
Macbeth Evans Glass Co.	General Petroleum Corp.
U. S. Steel Corp.	The Pusey & Jones Co.
International Coal Products Corp.	Hyatt Bearings Division
Walworth Mfg. Co.	General Motors Corp.
Bethlehem Steel Co.	Valentine Varnish Co.
U. S. Rubber Co.	Crane Co.
Watertown Arsenal	U. S. Aluminum Co. of America
	U. S. Naval Ordnance Plant, W. Va.

### THE PRINCIPLE

Surface Combustion is a process of burning gaseous fuel homogeneously pre-mixed with sufficient air to form an explosive mixture, even to the point where the fuel is completely burned and no free oxygen left; the burning yielding in every case products of combustion at their highest temperature which make possible the development of a maximum amount of heat in the form of radiant energy.

Surface Combustion brings into play the accelerat-

ing influence on combustion of hot surfaces, their influence allowing a far greater volume of fuel to be burned in a given space than could otherwise be done.

### WHAT SURFACE COMBUSTION ACCOMPLISHES

When a fuel is burned with a 100% generation efficiency, as is evidenced by no free O or CO in the resultant products, and when such generation develops the maximum amount of heat as radiant energy and concentrated products at their maximum temperature, so that absorption by radiation and convection is at its highest point of efficiency, then certainly the acme of heating perfection, by combustion methods, is obtained. Surface Combustion makes this possible.

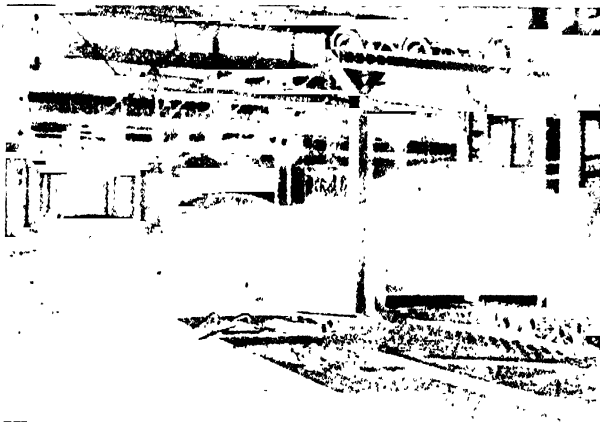
### THE APPARATUS

The component parts of a typical Surface Combustion appliance may be listed as follows:

- (1) Furnace,
- (2) Burners,
- (3) Proportioning Devices,
- (4) Equipment for delivery of gas and air.

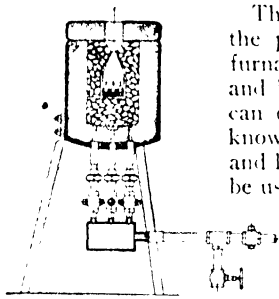
(1) **Furnaces:**—The foundations, metal-work, brickwork and insulation of Surface Combustion furnaces do not differ widely from the approved designs for furnaces employing other systems of combustion.

The refractory differs, however, from that in use in other furnaces. In one type of Surface Combustion furnaces refractory is used as a bed in which the mixture is burned. The burner and the bed are interdependent, the combination of the two producing the effects outlined. In some cases the bed may be solid pieces of refractory of suitable shape and size, or it may be made up of loose broken refractory. Almost any refractory which will stand the temperatures obtained and at the same time possess the necessary physical and chemical properties can be used.



SURFACE COMBUSTION FORGE AND PLATE AND ANGLE

*Continued on Next Page*



**SURFACE COMBUSTION CONE FUSION FURNACE FOR VERY HIGH TEMPERATURE TESTING**

The method of determining the proper type and size of a furnace to do a given amount and kind of work is one which can only be learned through a knowledge of the possibilities and limitations of the process to be used. There is no element in

this which is peculiar to Surface Combustion. We are, however, prepared to study the requirements of your process and design for you suitable furnaces embodying

the advantages of the Surface Combustion process.

(2) **Burners:**—The burners used in Surface Combustion equipment are the result of a careful study of the requirements of our process. They are of what is called the impact, tunnel, expanding jet, opposed jet, etc., which localize the combustion.

It was found early in the development of Surface Combustion that the nozzle or tip of the burner, if to operate successfully at all burner pressures, must be kept cool. This feature has been provided for, without resorting to water cooling with its many disadvantages, by means of an arrangement of fins whereby the heat is drawn back from the burner and absorbed by the surrounding air. This arrangement has proved entirely successful in all of our numerous installations.

(3) **Proportioning Devices:**—All Surface Combustion installations include a proportioning device which guarantees (1) the delivery of a properly proportioned mixture, (2) the delivery of a homogeneous mixture, and (3) the control of such a mixture located in a single valve.

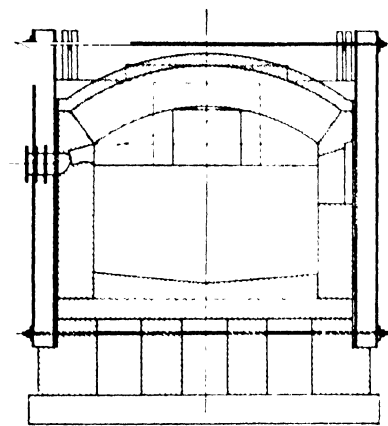
We ordinarily employ one of two proportioning devices: (1) the low pressure system which utilizes gas at from two to six inches water pressure and air under a pressure varying from  $\frac{1}{4}$  lb. per sq. in. to approximately 1 lb. per sq. in. This system is used mainly on small appliances; (2) the high pressure system which utilizes gas under pressure, ranging from 5 lbs. per sq. in. upward. The advantages of this system over the low pressure system lie mainly in its simplicity. Large quantities of gas can be handled in small pipes. It is also a one-pipe system which always has advantages over a two-pipe system, such as is the low pressure system. Where high pressure gas is available, direct from the gas mains, it is the most economical system that could be used, as it eliminates all motors, blowers and air piping and cuts down the size of the gas piping to a minimum.

Where high pressure gas is not available, direct from gas mains, a suitable gas booster may be installed designed to give the necessary maximum capacity at a 10-lb. pressure.

(4) **Equipment for the Delivery of Air and Gas:**—It would take a great deal of time to go into detail regarding the equipment covered under this heading. As before explained, almost num-



**THE RATIOMETER**  
Automatically maintains correct combustion in gas-fired furnaces. Can be applied to any two valve type of furnace.

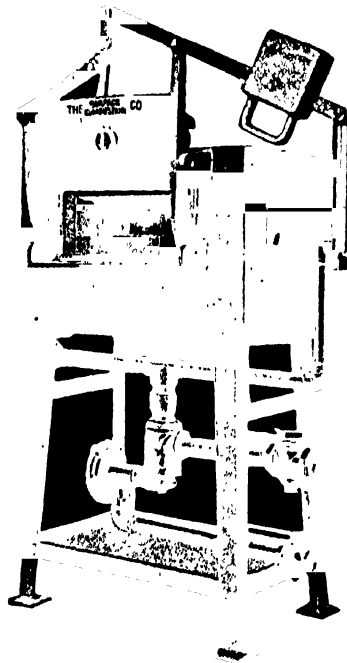


**SURFACE COMBUSTION DAY TANK FOR MELTING GLASS**

berless combinations are met with and must be considered and understood. Roughly, apparatus for delivering gas and air may be divided into four classes:

(1) fans, (2) positive pressure blowers or boosters, as the gas blowers are called, (3) mixing compressors, (4) compressors.

All these machines can be used with Surface Combustion and it is felt that no one, two, three or a dozen machines can be picked to fit the various conditions arising. It is our practice to select the best machine for a given condition. For driving the above machines electricity, steam, or any form of power may be used.



**SURFACE COMBUSTION FURNACE FOR ANNEALING AND HARDENING**

## CONSULTING SERVICE

It is our aim on these pages to give an idea of what Surface Combustion is and the extent to which it can be applied in the chemical and allied industries.

If your manufacturing processes are such as to involve heating of furnaces, stills, dryers, roasters, ovens, kilns or other equipment, marked economies can be effected by the introduction of Surface Combustion equipment.

In many cases this will not involve the entire discarding of your present equipment. We can often redesign your present furnace or other equipment so as to introduce Surface Combustion with but slight modification of your plant as it now stands.

# SWENSON EVAPORATOR COMPANY

Main Office, 945 Monadnock Building

CHICAGO, ILLINOIS

EASTERN OFFICES

519 W. Denver Building, Philadelphia, Pa.

10 Church Street, New York, N. Y.

Cable Address:  
SWENSON EVAPORATOR CO., Chicago  
Western Union Code

## PRODUCTS

Various types of Evaporators, Single and Multiple Effect; Vacuum Pans; Leaching Batteries; Causticizing Equipment; Beet Sugar Machinery; Pulp Mill Machinery; Special Chemical and Waste Product Machinery; Condensers; Heaters; Continuous Crystallizers.

## MATERIALS HANDLED IN EVAPORATORS

The following is a partial list of the materials that our machines are actually concentrating in a satisfactory manner

Aluminum Sulphate	Glue	Sodium Sulphate
Ammonium Chloride	Glycerine	Sorghum Syrup
Beef Extract	Iron Sulphate	Stoop Water
Bittern	Magnesium Chloride	Steffens Water
Black Liquor	Malt Extract	Sugar
Calcium Acetate	Mercurizing Waste	Sulphate Water
Calcium Chloride	Milk Whey	Tankwater
Caustic Soda	Molasses Waste	Tannin Extract
Distilled Water	Peppin	Tartaric Acid
Fertilizers	Polash	Tobacco Extract
Fish Water	Potassium Sulphate	Tomato Pulp
Fruit Juices	Salt	Twichell Water
Garbage Water	Sodium Benzo Sulphonate	Western Lake Waters
Gelatin	Sodium Carbonate	Zinc Chloride
Glucose	Sodium Nitrate	Zinc Sulphate

## INDUSTRIAL EVAPORATION

The scope of industrial evaporation is somewhat larger than is ordinarily recognized. A constantly growing number of chemical and other manufacturing processes require the removal of water from dilute solutions, and this evaporation work is an important and indispensable part of such processes.

The above list may be accepted as representative of a growing number of industries using evaporating plants either for intermediate products, main products, or by-products.

As an illustration of the magnitude of the work done by Swenson Evaporators, we figure that when all our installations are running at full load, 24 hours per day, there would be a total evaporation of 32,000,000 gallons of water per day.

## RANGE OF SIZES

Swenson Evaporators are built in sizes ranging from 100 to 20,000 gallons per hour evaporation

## TYPES OF EVAPORATORS

Standard Swenson Type

Swenson Basket Type

Standard Vertical Tube Pans

Swenson Type K—Semi-Film

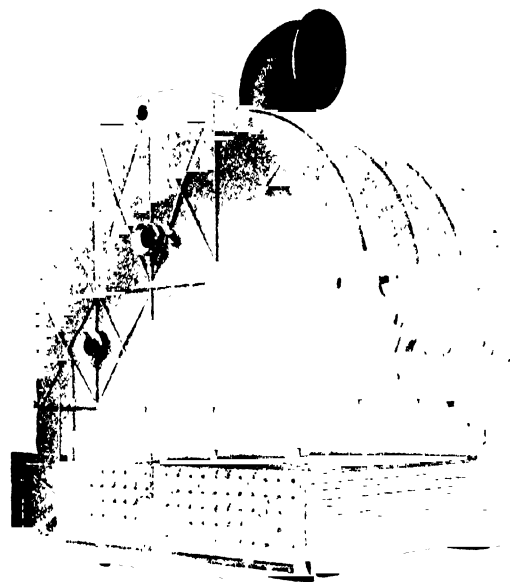
Swenson High Concentration Type

**Special Types**—to meet exceptional demands and produce unusual results.

## SWENSON STANDARD HORIZONTAL TUBE EVAPORATORS

The type of evaporators that seems to be most adaptable to extensive use is our Standard Swenson Horizontal Tube Type. It is natural that this should be so because of its simplicity.

Our Standard Swenson is a rectangular shaped evaporator with horizontal tubes located near the bottom of each effect. It is made up in sections of heavy cast iron plates with machined and drilled faces and flanges. The assembled castings are bolted together with suitable packing material (usually sheet asbestos) making a vacuum tight joint.



STANDARD SWENSON HORIZONTAL TUBE TYPE SHOWING BRACING AND TUBE ARRANGEMENT



DETAIL OF TUBE PACKING

- (1) Section of tube plate Cast as a part of steam chest of Standard Swenson
- (2) Packing plate stud
- (3) Nut for packing plate stud
- (4) Tubes (heating surface)
- (5) Standard tube gasket (made for  $\frac{3}{4}$ ",  $\frac{7}{8}$ " and  $1\frac{1}{4}$ " O. D. tubes). Taper side of gasket goes next to tube plate
- (6) Standard 4 hole Swenson packing plate Also made for 6 and 8 tubes

*Continued on Next Page*

There is a steam chest at each end cast as an integral part of the vertical tube sheets. Each tube passes through both tube sheets and is packed by standard Swenson packing plates and rubber gaskets. This scheme of packing has proved a great source of satisfaction to our customers for many years. It combines vacuum tightness and resistance to high temperature with great ease of removal.

One of the most important features of the Standard Swenson is the readiness with which transportation and erection can be effected.

This type of evaporator requires small headroom (in most cases only 12 feet) and as it is shipped in sections, can be taken into a building through an ordinary door.

This sectional construction is also an advantage when export shipment must be made as the relatively small weight of our boxes (we box completely with heavy lumber and with very few exceptions, no box weighs over 4,000 lbs.) and their compactness gives our clients the benefit of minimum ocean freight rates and minimum handling charges, and also permits of transportation and handling in places where heavier and larger boxes could not be used.

#### SIZES

We have patterns for sizes ranging from our small semi-commercial research laboratory size to our large units capable of handling upwards of 20,000 gallons per hour. Our designs and patterns are very complete and these have been standardized so that we are in a position to furnish an evaporator for practically any capacity without making any new shop equipment. Modern shop practice as regards the use of metal templates, jigs, etc., is followed wherever possible and because of our large permanent investment in patterns, templates, etc., our customers are benefited by being able to secure prompt and accurate service when repairs are needed. Our evaporators are, of course, supplied for vacuum as well as low pressure service and are built as single or multiple effects, depending on the work to be done.

#### SWENSON PATENTED BASKET TYPE

This type is made for high pressure or vacuum evaporation, single or multiple effect, and is designed for concentrating heavy liquids, scale forming liquids, or where a precipitation of crystals or other solids occurs. A vertical tube arrangement is employed.



**SWENSON PATENTED BASKET TYPE TRIPLE EFFECT**

Cast iron, steel, pure iron or copper bodies, steel, pure iron or copper steam basket, vertical tubes, condenser, vacuum, condensation and liquor pumps.

The chief advantages of the Basket Type are flexibility in capacity, adaptability to relatively heavy

solutions, method of steam and liquor circulation, and ease of scale removal.

The chief feature of the basket type is the internal steam basket. Steam is admitted at the top center and distributed among the vertical tubes, which are expanded in the top and bottom of the basket.

The use of this basket suspended in the center of the body of the evaporator brings about a maximum circulation of the boiling liquor. The annular downtake space has an area more than sufficient to handle all the descending boiling solution. The entire heating element is submerged in the boiling solution so that radiation loss is reduced to a minimum.

Any hard scale forming in the tubes can be removed mechanically in the same manner boiler tubes are cleaned. The rapid circulation tends to keep this type of evaporator cleaner than other vertical tube machines.

Where extensive repairs are needed, the basket can be removed through the top without interfering with the setting or evaporator body.

When the liquid being evaporated deposits crystals, a deep cone bottom is supplied in which these crystals settle. They can be discharged from these bottoms into receivers, closed salt filters, open filters or centrifugals. It is a very efficient machine for a precipitating solution.



**INTERNAL STEAM BASKET USED IN SWENSON PATENTED BASKET TYPE**

Steam admitted top center and distributed among vertical tubes expanded in top and bottom heads.

Solutions having high boiling points are efficiently handled by this type of evaporator, as the effective temperature difference can be easily increased by using any steam pressure necessary. It gives a product of very high density, because of the perfect natural circulation of liquor and steam. Salt Caustic is concentrated to 48°-50° Baume (hot) in this machine.

The maximum of circulation obtained is due to our patented construction, which eliminates all counter-currents in the downtake.

#### SWENSON TYPE K - SEMI-FILM

This is a newly patented type, and is an entire innovation. It is especially suitable for handling foamy liquors and has the additional advantage that it gives a very high circulation of the liquor and complete circulation of steam. It further allows the removal of non-condensable gases without loss of economy. No pumping of liquor.

#### HIGH CONCENTRATING TYPE EVAPORATOR

This type is an adaptation of the Swenson Basket type with a forced or accelerated movement of the

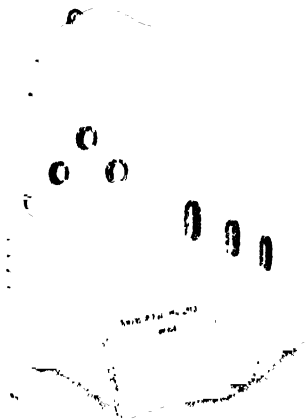
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liquor. It will handle practically any solution, and the concentration can be carried to almost any desired density provided the solution remains fluid.

High steam pressure and high vapor pressure can be maintained. The heating tubes remain clean even with a heavy viscous liquor containing a large percentage of crystals and suspended matter. Calcium and magnesium chloride are concentrated in this type and discharged directly into the shipping drums.

#### STANDARD VERTICAL TUBE TYPE

This design (for large installations) can be equipped for crystallizing solutions and also for straight concentration work. It is fitted with our patented vapor and steam device giving a perfectly uniform distribution of vapor to all tubes, by this means increasing the amount of work possible with a given tube area.



SPECIAL LEAD EVAPORATOR

#### SPECIAL TYPES

The Swenson Evaporator Company by no means confines itself to the standard types of evaporators. On the contrary our engineers are constantly employed in converting the conventional apparatus to meet peculiar conditions and produce specific effects. Where our standard units are not adaptable we build special apparatus to more economically meet the demands.

#### INSTALLATION

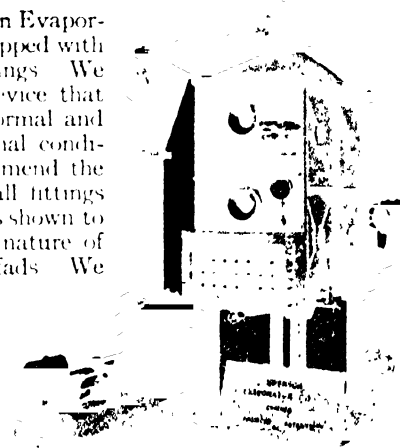
All Swenson evaporators are completely set up before shipment and thoroughly assembled by our experienced mechanics. Nothing is left to be done on the field which can be done in our shop. Consequently the time required to install one of our units is the minimum, and all parts fit closely.

Every Swenson evaporator is complete and ready to run when set up on foundations provided by the customer and connected to customer's pipe lines. We make a special feature of the location of every fitting so as to have them accessible and convenient for all purposes.

#### AUXILIARIES AND FITTINGS

We have given the most careful study to the selection and development of vapor piping, condensers, catchalls, salt receivers and pumps furnished as auxiliaries to our evaporators, and have developed maximum efficiency in operation, low first cost, and durability of construction.

Every Swenson Evaporator is fully equipped with all necessary fittings. We supply every device that is needed for normal and also for occasional conditions, but recommend the elimination of all fittings that practice has shown to be more in the nature of ornaments or fads. We advise against the spending of money for a fitting that we know from experience will be out of service in a short time because it is not really needed.



SWENSON JUNIOR STANDARD SINGLE EFFECT

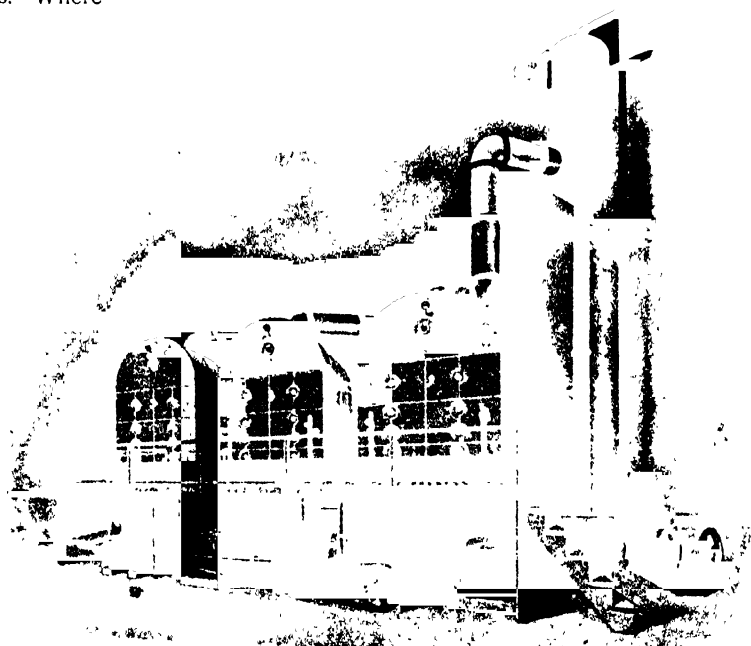
#### MATERIALS OF CONSTRUCTION

The majority of solutions can be handled most advantageously in evaporators having cast iron shells or bodies. There are, however, occasions when other materials of construction are necessary or desirable. In these cases, we build machines of tank steel, firebox steel, sheet copper, cast steel, pure iron, cast brass, bronze, aluminum, lead, etc.

We try to have every installation a profitable one for the customer and only offer an expensive construction when we feel that this is absolutely necessary from an investment standpoint. All of our evaporators are durable, but the materials used are determined entirely by the conditions that exist.

In all our evaporators we employ tubular heating surfaces, and these can be made of welded or seamless steel, charcoal iron, aluminum, copper, brass, lead, etc.

Auxiliary parts such as pipe, catchalls, condensers, etc., are made of those materials which in relation to first cost seem most economical in the end.



LARGE TRIPLE EFFECT WITH C. C. C. CONDENSER, VACUUM AND CONDENSATION PUMPS

*Continued on Next Page*



## ECONOMY RATING OF EVAPORATORS\*

Steam Consumption of Evaporators and Cooling Water

Requirements of Condensers

** Total Capacity U. S. Gals. per Hour	Steam Consumed Pounds per Hour				(Cooling Water to Condenser - U. S. Gallons per Minute)											
	Single Effect	Double Effect	Triple Effect	Quad- ruple Effect	Single Effect			Double Effect			Triple Effect			Quadruple Effect		
					Temp. of Injection - ° F.			Temp. of Injection - ° F.			Temp. of Injection - ° F.			Temp. of Injection - ° F.		
					60	70	80	60	70	80	60	70	80	60	70	80
100	925	465	310	230	4	52	70	21	26	38	14	17	24	11	13	18
150	1390	695	465	345	63	78	105	32	39	53	21	26	35	16	20	26
200	1850	925	620	465	84	104	140	42	52	70	28	35	47	21	26	35
300	2775	1390	925	695	126	156	210	63	78	105	43	52	70	32	39	53
400	3700	1850	1240	925	168	208	280	84	104	140	56	69	95	42	52	70
500	4625	2315	1540	1160	210	260	350	105	130	175	70	84	115	53	65	88
750	6940	3475	2315	1730	290	360	480	160	195	265	105	130	175	79	98	140
1000	9250	4640	3080	2310	390	480	640	210	260	350	140	175	245	105	130	175
1250	11560	5780	3860	2890	490	600	800	245	300	400	175	215	290	130	165	220
1500	13880	6940	4630	3470	585	720	960	295	360	480	210	260	350	160	195	265
2000	18500	9250	6170	4630	780	960	1280	390	480	640	260	330	475	210	260	350
2500	23130	11570	7710	5790	975	1200	1600	490	600	800	325	400	535	245	300	400
3000	27750	13880	9250	6940	1170	1440	1920	585	720	960	390	480	640	295	360	480
4000	37000	18500	12410	9250	1560	1920	2560	780	960	1280	520	640	855	390	480	640
5000	46250	23130	15400	11560	1950	2400	3200	975	1200	1600	650	800	1065	490	600	800
6000	55500	27750	18500	13880	2340	2880	3840	1170	1440	1920	780	960	1280	585	720	960
7000	64750	32380	21580	16190	2730	3360	4480	1365	1680	2240	910	1120	1495	685	840	1120
8000	74000	37000	24670	18500	3120	3840	5120	1560	1920	2560	1040	1280	1705	780	960	1280
9000	83250	41630	27750	20810	3510	4320	5760	1505	2160	2880	1170	1440	1920	880	1080	1440
10000	92500	46250	30840	23140	3900	4800	6400	1950	2400	3200	1300	1600	2135	975	1200	1600
12000	111000	55500	37000	27750	4680	5760	7680	2340	2880	3840	1560	1920	2560	1170	1440	1920

Compiled by the Engineers of Swenson Evaporator Co.

\* Figures in this table do not represent the best performance of our evaporators and condensers, but are compiled with reasonable allowance for the fluctuations and variations of average practice. Steam and cooling water requirements will often be found less, and sometimes somewhat more, than indicated. Steam consumption, for instance, varies with different efficiencies of heat insulating covering employed, while cooling water requirements are affected by air content of the injection water, and other factors. Any data obtained from this table will be found to agree closely with data generally obtained from actual operation.

\*\* In the case of a multiple effect figures given are for combined evaporation from all effects.

† Amount of heating steam applied to first effect, at pressure of 4 to 5 pounds, when liquor is fed to evaporator at approximately 120 degrees F. Different steam pressure, or reasonably different temperature of feed liquor will affect figures within a few per cent only.

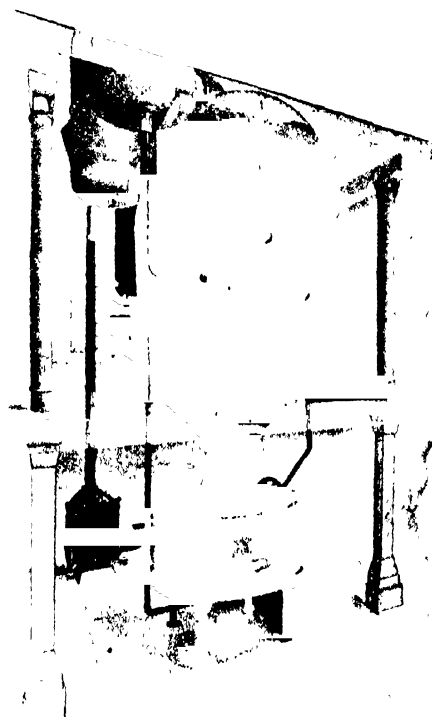
‡ Based on 26-inch vacuum (referred to 30-inch barometer) in last effect. Figures above heavy black line are for parallel current jet condensers, below heavy black line for counter current cataract condensers. The type of condenser usually employed is as indicated by this statement.

## MULTIPLE EFFECT ECONOMY

The above table gives some figures illustrating the saving brought about by the use of a multiple effect evaporator where large quantities of water are to be boiled off. The economy both of steam and condensing water required is directly proportional to the number of effects.

## SERVICE

We have a complete organization of thoroughly trained men, and are therefore in a position to give the thorough service one expects when buying an evaporator. Our records for many years can be used in designing new and special forms for special purposes.



STANDARD SWENSON SINGLE EFFECT

For glycerine, cast iron body, hopper bottom, copper horizontal tubes, catchalls, jet condensers, closed salt filter, vacuum pump.

## DATA REQUESTED

Please cover the following points as completely as possible, as careful attention in submitting information may save needless correspondence. All information treated strictly confidential.

1. Analysis of liquor. If not available send sample.
2. Quantity to be handled in the evaporator.
3. What will be the average initial density (specific gravity, Baumé, Twaddell, or percentage of solids)?
4. What final density or condition is desired?
5. What is the initial temperature?
6. Are there any marked effects or changes of properties produced by temperature changes?
7. What are the boiling points at atmospheric pressure of the dilute solution and the same solution at the final state of concentration which you wish to reach?
8. State any peculiar properties such as tendency to foam, entrain, evolve gases, become viscous, deposit crystals, sludge, etc.
9. Are there any scale-forming ingredients, such as sulphate of lime, phosphate of lime, silica, etc.?
10. What steam is available for evaporation purposes, live or exhaust? Will it be necessary to install a boiler?
11. In what quantity is water available to operate a condenser? What is the source of the water and at what temperature can it be obtained? State quality of water.
12. Include any other information that might be deemed helpful.

## OVER HALF OF OUR ORDERS ARE REPEAT ORDERS

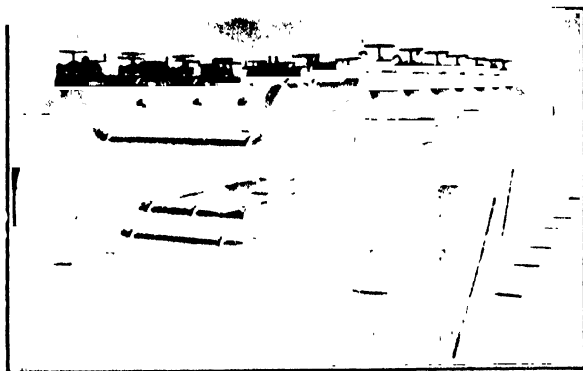
Catalog on request.

*Continued on Next Page*

**SWENSON SUGAR MACHINERY**

Juice Heaters and Boilers	Crystallizers
Carbonators	Lime Kilns
Sulphur Burners	Diffusion Batteries
Pre-Evaporators	Beet Wheels
Multiple Effects	Beet Washers
White and Raw Sugar Pans	Beet Pulp Presses

In building beet sugar machinery over a period of years we have constantly changed and improved certain machines, while others, having been tried and found satisfactory from standpoint of design and durability, remain substantially in accordance with our earlier patterns



**14-CELL SWENSON BATTERY**

Recently shipped to Korea to be used in conjunction with a full line of our machinery installed in an 800-ton factory

**SWENSON PULP MILL MACHINERY**

Digesters	Incinerators
Disc Evaporators	Causticizers
Melt Tanks	Evaporators
Diffusers	Smelters

We have developed this line of machinery for both the *soda* and *sulphate* process, and are in a position to furnish practically all the special apparatus needed in the recovery end of these industries. Our experience has been such as to insure the success of our designs in detail, both large and small. Our machinery is widely used in this field and a list of our customers will be supplied on request, limited space here not permitting same.



**PART OF RECLAIMING ROOM IN SULPHATE MILL**  
Showing Swenson Incinerators 9' 0" dia. x 24' 0" long

**CONDENSERS,**

We build three types of condensers:

- (1) Wet System Jet Condensers
- (2) Counter Current Cataract (c c c.) Dry System Condensers, and
- (3) Multi-pass Surface Condensers

Every evaporator equipment is given careful study and the proper type of condenser determined, depending on operating conditions

Our Jet type is cast in one piece, is very efficient, and is usually used with our smaller equipments where a high vacuum is not essential

Our c c c type is made with a steel or cast iron shell, depending on the kind of water used. This type will give a very high vacuum and is economical from the standpoint of amount of water used.

Surface condensers are used only where the distillate is to be saved, or where economical use can be made of the heat that passes into the water or solution used for condensing purposes



**SECTIONAL VIEW  
COUNTER CURRENT CATARACT  
CONDENSER**



**SECTIONAL VIEW  
PARALLEL CURRENT  
JET CONDENSER**

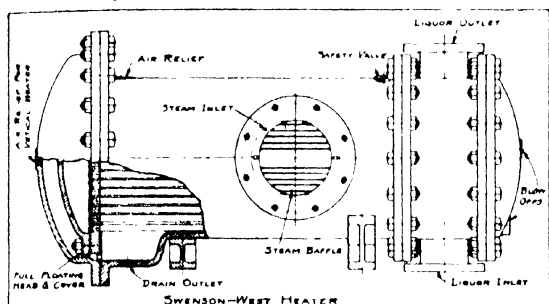
*Continued on Next Page*

## HEATER DEPARTMENT

The Swenson-West Heaters are made for heating oils, sugar juices, boiler feed water, chemical solutions of all kinds both dilute and concentrated.

We also build heaters for domestic service in hotels, apartments, factories, office and other public buildings.

Specially designed heaters, coolers, interchangers, economizers are manufactured for either heating or cooling any liquid, including the recovery of heat from all liquid wastes.

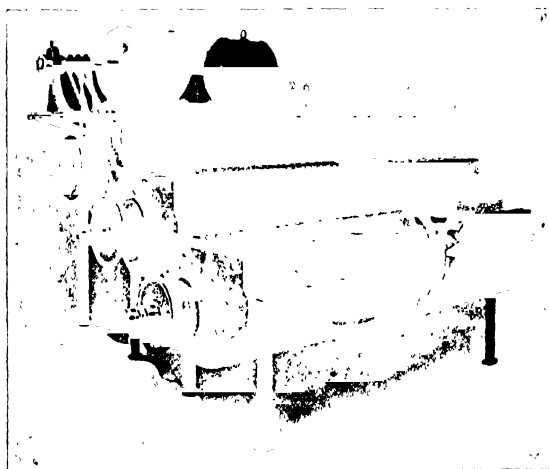


TYPICAL SWENSON-WEST HEATER

### Necessary Data Required:

1. Description and characteristics of liquid to be heated or cooled
2. Quantity to be handled per hour
3. Temperature of liquid to be heated or cooled and final temperature desired
4. Temperature of heating or cooling medium

**Construction Features**—Shells are made from high grade close grained cast iron; tubes are copper or brass, either plain or corrugated, as conditions require, and are expanded in the heads, one of which is full floating to take care of expansion strains. Liquor channels can be made of any metal required to take care of corrosive actions of liquids.



SWENSON-WALKER CRYSTALLIZER

## CRYSTALLIZER DEPARTMENT

The Swenson-Walker crystallizer was devised for the continuous crystallization of salts in a saturated solution where separation takes place when the liquor is cooled. A counter-current circulation of the liquor and the cooling water, and a constant removal of the crystallized salts are embodied in this system.

Complete data have been obtained on the crystallization of trisodium phosphate and glauber's salts and arrangements are being made for experimenting with

potash salts, sodium and potassium compounds, copers, epsom salts, phosphates and various other organic and inorganic materials.

Uniformity of the size and structure of the crystals; the production of salts free from impurities and of a high degree of fineness; the economical operation and the great labor saving; the automatic control of temperature by thermostats; the small initial investment and the little floor space required are but a few of the many claims we advance in connection with this patented apparatus.



VIEW OF EXPERIMENTAL STATION AT ANN ARBOR, MICHIGAN  
Showing Evaporators and Measuring Tanks

## EXPERIMENTAL STATION

The Swenson Evaporator Company's evaporator experiment station at Ann Arbor, Michigan, operated in cooperation with the University of Michigan, was primarily established for theoretical investigations regarding design. However, the facilities are so unusual that we have decided to accept concrete problems on the investigation of new processes and the adaptation of evaporators to particular solutions. This evaporator experiment station is fully equipped to make comprehensive and detailed reports with all the necessary numerical data.

Some of the problems already handled in this evaporator experiment station are: the manufacture of high grade table salt from very impure dilute brines; the manufacture of a high grade potash salt from complex western brines; the evaporation of a very viscous dextrin syrup of high densities; the design of a lead evaporator for the manufacture of alum, etc.

Our theoretical investigations are proceeding steadily and much valuable data has already been secured in the way of curves and constants, having to do with factors that affect evaporator design. We have prepared a program of work to be done that will probably take five years to complete, and maintain for this purpose, as well as for commercial investigation, an organization which devotes its entire time to these duties.

We have facilities for securing all data needed to properly design a commercial plant and also are preparing to handle processes involving filtration, crystallization and centrifugence in addition to the actual step of evaporation.

A reasonable charge is made for process work, also for simple experimenting, and our facilities are such as to permit us to make tests that are positively indicative of what may be expected in a large plant.

# SWEET'S STEEL COMPANY

Manufacturers of Steel Rails and Rail Accessories  
100 SWEET STREET, WILLIAMSPORT, PA.

BRANCHES  
Philadelphia, Pa. Land Title Bldg. Cable Address: SWEET STEEL CO.  
Wilkes-Barre, Pa. Miners Bank Bldg. Williamsport  
New York, N. Y. 2 Rector St. Western Union Five Letter Code

## PRODUCTS

Steel Tee Rails in light and heavy A.S.C.E. standard sections, also special sections.

Fabricated Track, Straight and Curved.

Track Accessories—Steel Cross Ties (or sleepers), Splice Joints, Angle Joints with complete track fastenings, Frogs, Switchpoints, Turnouts, Crossings, Track-Climbers, Approaches, Ground-throws, Spikes, Track Bolts, etc.

We also roll Light Steel Angles, Channels, Flats and Concrete Reinforcing Bars in plain round, square, twisted square, etc.

## STEEL RAILS AND FASTENINGS

We roll standard A.S.C.E. section rails, both light and heavy, from high grade new first quality stock. This stock is required to pass severe chemical and physical tests to insure a thoroughly satisfactory rail section. The care exercised in the selection of material and rolling insures a uniform rail, free from flaws and defects, and suitable for extremely hard usage.

**Lengths**—We furnish regular standard all fifteen ft. and thirty ft. lengths with 10% shorts to 22 ft., as well as mill lengths 22 to 30 ft. with splice bar punching. Other lengths supplied when desired, also bond drilling.

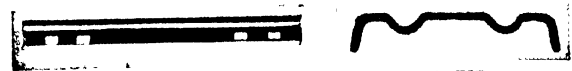
## STEEL CROSS TIES

The designing and rolling of our Steel Cross Tie Sections for Permanent, Portable Industrial or Mine Track is an evolution, and was not decided upon until after an exhaustive study on the part of our Engineering Department had been made of the several Steel Cross Tie Sections now on the market. In the designing of our Sections, we have not only eliminated the weak points of other Sections, but have strengthened the strong points. One of the prime factors making this possible is that we roll our Steel Ties from High Carbon Steel; in other words, the Carbon content of the Steel from which we roll is two to three times higher than that used in the rolling of competitive Tie Sections. This, combined with the double corrugated feature of the Ties, affords much greater resiliency, and at the same time greater rigidity, than that of any other similar Sections on the market. One other important feature with our Tie Sections is, that the double corrugation permits of the attaching of Tee Head Bolts and Clips directly opposite each other, which is a distinct mechanical advantage.

**Method of Attaching Rails to Ties**—The placing of Fastenings attaching Rails to Ties directly opposite each other over the flange of the Rails, using Tee Head Bolts and Clips, represents greater engineering and mechanical efficiency than the so-called staggering of Clips, and is conceded by Engineers and users to be by far the most practical, even in view of the fact that many methods of later design are being advocated.

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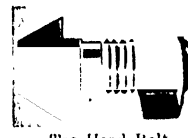
ned that even the most inexperienced laborer can perform his duties efficiently.



DOUBLE CORRUGATED STEEL CROSS TIE

No. 4 Section—Weight approximately 2½ lbs. per ft. for 8, 12, 16, and 20 lb. rails.

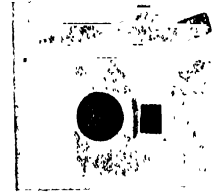
No. 5 Section—Weight approximately 3½ lbs. per ft. for 25, 30, 35, 40, and 45 lb. rails.



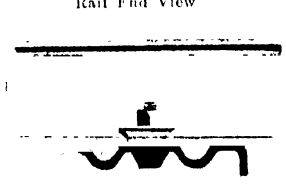
Tee Head Bolt



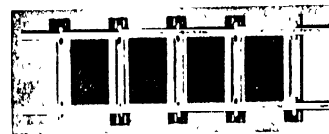
Rail End View



Clip



Tie End View



Assembled Section



Top View

## DETAILS OF TIE AND RAIL ASSEMBLY WITH BOLT AND CLIP ASSEMBLED SECTIONS

We furnish switches for two or three-way switching. Our standard two-way switches are ten feet long with a radius of fifteen feet, or fifteen feet with a radius of thirty feet. The standard three-way switches are fifteen feet long with a radius of thirty feet. Fifteen-foot switches are recommended especially in connection with portable track, as a fifteen-foot track section can be substituted for the switch or vice versa within a very few moments.

We also furnish Assembled Track Climbers, Crossings, Turnouts, Frogs and Switch-throwing devices.



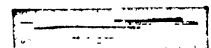
TWO-WAY SWITCH



THREE-WAY SWITCH



TRACK CROSSING



FROG



TEMPORARY CROSSOVERS OR CLIMBERS

# THE TERRY STEAM TURBINE COMPANY

MAIN OFFICE AND WORKS: HARTFORD, CONN.

BRANCH OFFICES AND AGENCIES IN PRINCIPAL CITIES

## PRODUCTS

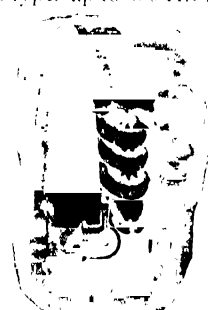
Terry Steam Turbines, condensing and non-condensing; Turbo-Generator Sets; Turbo-Pump Sets and Turbo-Blowers.

### TERRY TURBINES

Terry Turbines are furnished separately or with driven apparatus in complete units with or without reduction gears. Turbine sets include all kinds of centrifugal pumps for every service, turbo-generators, alternating or direct current, for lighting or power purposes; induced draft fans, exhausters, turbo-compressors and forced draft fans. Over 7500 Terry turbines in operation.

**Capacities**—Horizontal Terry turbines are built in sizes from 1 to 1500 H.P., vertical types up to 600 H.P.

**Description**—The aim in developing the Terry turbine has been toward perfection in design rather than minimum first cost. High operating efficiency, long life and low upkeep cost have been considered of more value than low price. The advisability of this policy is proved by the extensive use of Terry turbines in the exacting services of large central stations and ships of the U. S. Navy. The outstanding feature which makes the Terry so simple and reliable is its principle of operation. Steam is distributed by a steam chest or steam ring to a series of nozzles. In these nozzles the steam is expanded from approximately boiler pressure to exhaust pressure. Issuing from the nozzle at high velocity, it strikes the side of the steam bucket in which its direction is reversed 180°. As the initial impact absorbs only a part of the total energy the jet of steam passes into a reversing chamber which returns it to the wheel bucket. This action is repeated several times until all of the available energy is obtained.



**ACTION OF THE STEAM IN THE TERRY TURBINE**

Whereby the steam is returned to the wheel again and again until all the available energy is obtained.

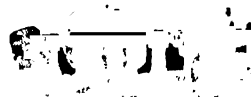
"The Indestructible Terry Wheel" is made of special composition steel with semi-circular buckets or pockets milled from the solid metal. The blade-like portion between these buckets receives no power-producing action from the steam but merely serves to split the jet. The power-producing action of the steam takes place entirely on the curved surface at the back of the bucket, therefore, erosion does not alter the angle at which steam enters or leaves the bucket. This is why the Terry maintains its original efficiency after a great many years of service. The fact that steam impinges against the wheel in a direction perpendicular to the axis makes it unnecessary to provide for end thrust. There is an inch or more side clearance on the wheel, the blades of which are protected by projecting rims. These projecting rims will take care of any rubbing which might occur if the radial clearance became reduced.

The essential feature of the Terry principle is that the multiple velocity effect necessary for highest economy in a single stage, non-condensing turbine is obtained in a single row of totally enclosed radial buckets instead of a number of rows of exposed buckets having side clearances.

### TURBO-GENERATOR SETS

Built in sizes up to approximately 1000 K.W.

Used extensively as main units in small plants or auxiliary sets in large plants. They are compact, fool-proof and will operate almost indefinitely without attention. Independent nozzle control gives high efficiency over greatly varying loads.



**TURBO-GENERATOR UNIT**  
We invite inquiries on A. C. and D. C. turbo-generator units up to 1,000 K.W.

### DUPLEX EXCITERS

These sets consist of an exciter-generator driven from one end by a motor and from the other end by a specially governed



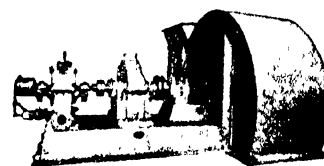
**DUPLEX EXCITER UNIT**

Used extensively because of reliability and adaptability to automatic heat balance.

The exciter ordinarily is driven by the motor. Should the motor fail the turbine will automatically take hold without causing appreciable fluctuation in the exciter voltage.

### FORCED AND INDUCED DRAFT SETS

Fan units are usually installed in objectionable locations, often requiring very light foundations in places where they are subject to excessive heat and dirt. The Terry turbine with its freedom from vibration, its ability to operate over long periods under adverse conditions without attention, is particularly adaptable to this service.



**INDUCED DRAFT FAN**

Small space and light foundations make it readily adaptable to plant conditions.

### TURBO-PUMP SETS

The Terry turbine is especially adaptable to driving centrifugal pumps because of its extreme flexibility of control. For power plant work it is far superior to electric motor drive because of its increased reliability.



**GEARED CONDENSER CIRCULATING PUMP**

We invite inquiries on complete pumping units for all classes of service.

### REDUCTION GEARS

The teeth are cut by the most accurate methods and the lubricating system is unusual in the ample supply of cool oil under pressure to the bearings. All Terry gears have forced feed lubrication, ring oiling not having been found satisfactory. Cooling is effected by large water chambers, cored in the walls of the gear case, doing away with risk of leakage where pipe cooling coils are used.



**THE TERRY GEAR**

Horizontally split throughout, giving complete accessibility.

### COMBINED TURBINE GEAR UNITS

In sizes up to 125 H.P. geared turbine units may be obtained in one common rigid frame casing. Each part of the unit possesses the same features of design contained in the separate turbine and gear. The advantages of this type of unit are: decreased cost, light weight, compactness, maintained correct alignment and no flexible coupling.

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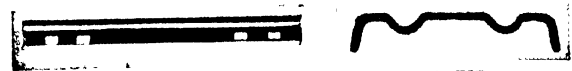
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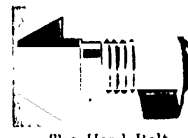
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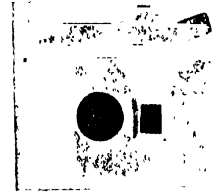
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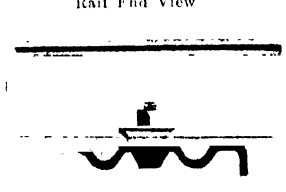
Tee Head Bolt



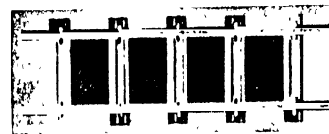
Rail End View



Clip



Tie End View



Assembled Section



Top View

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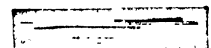
TWO-WAY SWITCH



THREE-WAY SWITCH



TRACK CROSSING



FROG



TEMPORARY CROSSEVERS OR CLIMBERS

# JOHN THATCHER & SON

Manufacturers of Steel Tanks

Cabinet Makers

Contracting Builders

56-60 PARK AVE., BROOKLYN, N. Y.

## PRODUCTS

Buildings in

Reinforced Concrete

Steel Construction

Brick Construction

Timber Construction

Cabinet Work

Steel Tanks

Light Structural Steel

Ornamental Iron Work

## SERVICES

An excellent organization (organized 1873) for the correct and rapid construction of Buildings of any nature or description, large or small. One of the few of its kind conducting a general building construction business that own and operate its own steel fabricating shops and cabinet shops, as well as conducting its own field construction operations, thus making it possible to render a complete service more speedily and economically than under the sub-contract system.

## A FEW OF OUR CLIENTS

Jones Bros. Co.

National Lead Co.

Thompson & Norris Co.

Arbuckle Bros.

United States Electro Galvanizing Co.

Benjamin Moore & Co.

Loft, Inc.

Frederick Loeser & Co.

Brooklyn Warehouse & Storage Co.

Abraham & Straus.

Richard Young Co.

Brooklyn Union Gas Co.

Brooklyn Edison Co., Inc.

New York Telephone Co.

Brooklyn Rapid Transit Co.

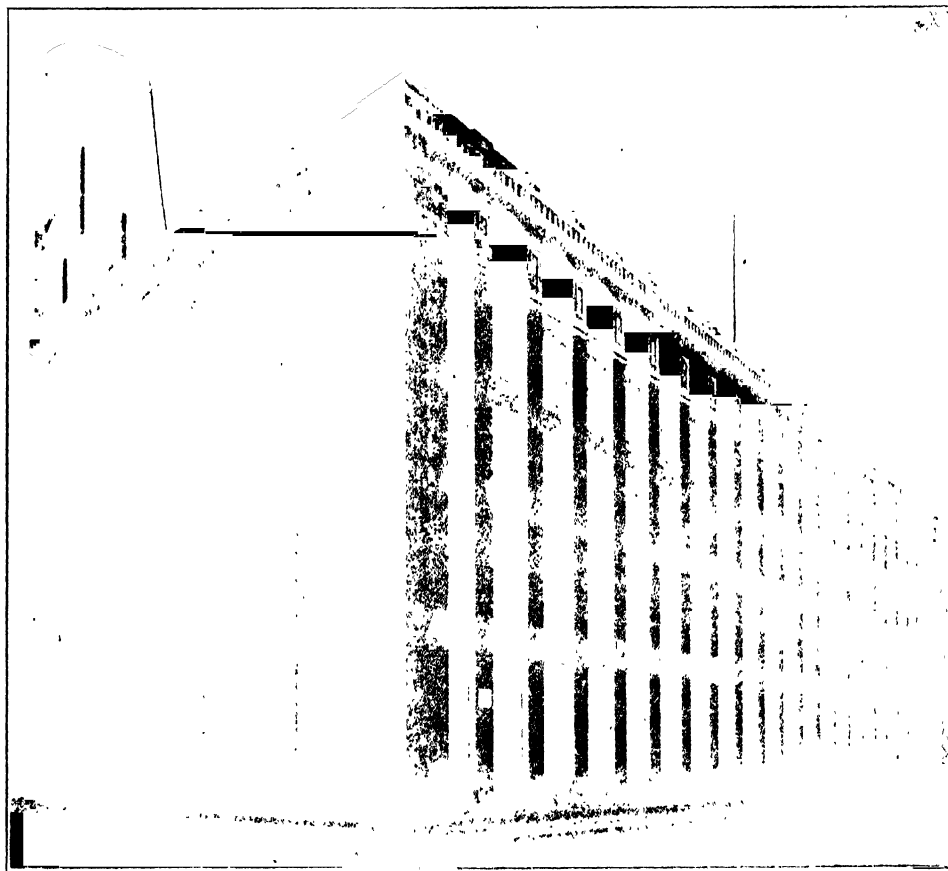
New York Central & Hudson River R.R. Co.

Fraser & Neave Co.

Chelsea Fibre Mills

Maltine Company

E. R. Squibb & Sons



PLANT OF RICHARD YOUNG CO., NEW YORK, N. Y.

# THE THERMAL SYNDICATE, LTD.

Borden Building  
350 Madison Ave., at 45th Street  
NEW YORK, N. Y.

MAIN OFFICE: Wallend-on-Tyre, England



## PRODUCTS

Vitreosil Concentrators; Condensing Equipment; Coolers; Crucibles; Cylindrical Retorts, Pots and Linings; Distilling Outfits; Electrically Heated Stills; Electrical Immersion Heaters; Evaporating Dishes; Fume and Outlet Pipes; Glover Tower Outlets; Hydrochloric Plant; Niter Pot Pipes; Nitric Details; Pipe, Plain or Socketed; Retorts; Retorts for Mercuric Chloride Manufacture; S-bend Sets; Steam Jets; Tanks; Towers, Reaction, Denitration or Absorption; Trays; Tubes for Reactions; Special Chemical Plant Equipment; Transparent Tubes and Utensils; Vitreosil Laboratory Apparatus (Combustion and Pyrometer Tubes, Crucibles, Evaporating Dishes, Capsules, Casseroles, Beakers, Muffles, Rods, etc.).

Vitreosil is the registered trade-mark name for the fused pure silica and quartz wares made by the patented electric furnace process of The Thermal Syndicate, Ltd.

Vitreosil is protected by the following United States patents covering both product and process:

812,399 Feb. 13, 1906

822,424 June 5, 1906

836,558 Nov. 20, 1906

Reissue 13,504 Jan. 7, 1913

## GENERAL

It was not until the development of the electric furnace process of The Thermal Syndicate, Ltd., that fused silica apparatus of suitable size for manufacturing processes or ware sufficiently low in price for ordinary laboratory operations could be produced. The articles produced by the fusion of rock crystal in the oxyhydrogen blowpipe prior to the successful adaptation of the electric furnace to this problem in 1904 were of very limited size and so expensive as to render their utilization commercially impossible.

The raw material used in the manufacture of vitreosil is extremely pure, the finished product containing about 99.8%  $\text{SiO}_2$ . No foreign ingredient is added to the raw material at any stage of the manufacturing process.

The ordinary quality of vitreosil, especially in the larger sizes for the chemical industries, is opaque on account of the inclusion distributed through the mass, of innumerable small air bubbles representing the interstices between the original grains of raw material when packed in the furnace. The transparent and translucent qualities of the ware are produced by special methods which permit the exclusion of the greater part of the air bubbles. Transparent vitreosil is considerably stronger than the opaque variety, and is also slightly heavier.

## PHYSICAL PROPERTIES

**Critical Temperatures**—The melting point of vitreosil is  $1750^\circ\text{C}$ , its softening point  $1400^\circ\text{C}$  and the devitrification point about  $1100^\circ\text{C}$ , the latter depending somewhat on the surrounding atmosphere. It is therefore practicable to employ suitable vitreosil equipment for continuous use up to  $1100^\circ\text{C}$ , and for intermittent use at much higher temperatures.

**Thermal Expansion**—One of the most valuable of

the many unusual characteristics of vitreosil is its extremely small expansion and contraction with variations of temperature, its linear expansion of .0000054 per degree Centigrade being the smallest of any known material. The following table shows a comparison with other well known substances:

Material	Linear expansion per degree Centigrade
Fused Silica	.0000054
Nickel Steel (36% Ni)	.000009
Glass—Jena 59	.000057
Glass—Pyrex 702 T.F.	.000045
Borlon Porcelain	.000028

This small expansion coefficient results in the remarkable resistance to sudden temperature changes which is often demonstrated in the case of small vitreosil articles by heating the utensil to redness and immersing it in cold water, repeated treatments not weakening the ware in any way.

**Hardness**—Vitreosil is extremely hard as is shown by the fact that it will scratch glass readily, its degree of hardness being number seven on Moh's scale where the diamond ranks as ten. This property is of importance where attrition is likely to result in depreciation of softer materials as in Glover Tower exit pipes.

**Weight**—The specific gravity of transparent vitreosil is approximately 2.22 and of the non-transparent material about 2.07. In many parts of a chemical plant, this light weight as compared with metals is a decided advantage in arranging supports and accessories for cooling and condensing details.

**Electrical Characteristics**—Investigations by the Bureau of Standards and the National Physical Laboratory show the superiority of fused silica as an electrical insulator compared with glass, porcelain and similar materials, the resistance decreasing much more slowly with rise of temperature, while the higher melting point of fused silica permits its employment at temperatures where the use of glass and porcelain is out of the question. According to Bureau of Standards Scientific Paper No. 234, hard rubber, mica, porcelain and glass have much smaller volume resistivities than fused quartz, even at room temperature. The dielectric strength of vitreosil is also very high.

**Vitreosil is Non-Hygroscopic**—As moisture does not readily condense on its surface, leakage with vitreosil insulators is likely to be much less than with glass and ceramic materials. It has been found that fused silica is an excellent insulator even in an atmosphere saturated with moisture.

**Constancy of Weight and Volume**—Experiments have shown that vitreosil is superior to platinum in constancy of weight and on account of its negligible coefficient of expansion it does not alter in volume at the temperatures attained in work with hydrometers, pycnometers, manometers, etc. When used for higher temperatures as in the construction of mercury or gas thermometers or thermostats the small change in volume which occurs is constant for the rise in temperature and the apparatus returns to its original volume without appreciable lag upon cooling.

**Optical Properties**—Fused quartz or silica is the only material available in the various forms required

*Continued on Next Page*



for work with ultraviolet light which possesses sufficient transparency to the short wave lengths whose activity is utilized in industrial illumination, for sterilizing liquids, and for accelerating chemical reactions. The optical properties of transparent vitreous quartz have not been fully studied, but its approximate index of refraction is apparently decidedly less than that of unfused quartz.

**Permeability**—Vitreosil becomes slightly permeable to hydrogen, though to a less extent than platinum, at about 1000 C. It is, however, gas tight under ordinary conditions and is extensively employed in the form of vacuum tubes for high temperature work.

Vitreosil tubes may be readily evacuated and can of course be employed at much higher temperatures than glass tubes without danger of collapsing.

**Solubility**—The most delicate electrical and chemical tests point to the complete insolubility of vitreosil in distilled water, no other material known being its equal in resistance to the solvent action of pure water.

#### CHEMICAL PROPERTIES

**Resistance to Acids**—Sulphuric, nitric, hydrochloric, hydroiodic, hydrobromic, arsenic and chromic acids as well as the halogens are without action on vitreosil regardless of concentration or temperature. Phosphoric acid has a slight but appreciable action, while hydrofluoric acid attacks fused silica to about one-sixth the extent of its action on glass.

**Resistance to Metals and Elemental Substances**—Molten zinc, cadmium and tin and the noble metals do not attack vitreosil appreciably, and there is no noticeable chemical action with molten sulphur.

**Resistance to Alkalies and Basic Substances**—At normal temperatures vitreosil is attacked in a smaller degree by alkaline solutions than the best grades of glass, but at higher temperatures it is strongly attacked by alkalies. Ammonia is, however, an exception and may be purified by distillation in vitreosil apparatus. Metals which form basic oxides should not be heated in vitreosil under oxidizing conditions, and the ware will not stand direct contact with caustic alkalies at high temperatures.

#### APPLICATIONS

Vitreosil will be found of particular value to technologists and manufacturers in the following fields:

Actinochemistry	Pharmaceutical and Medical Chemicals
Analytical Laboratories	Phosphoric Acid
Chlorinations	Physical Laboratories
Chlorosulphonic Acid	Precious Metal Refining
Electrical Insulators	Pyrometry
Ferric Chloride	Radium Compounds
Heaters, Electrical	Reagents
Heaters, Gas	Research Laboratories
Hydroiodic Acid	Sulphuric Acid
Hydrobromic Acid	Thermometry
Hydrochloric Acid	Thermostatic Control
Lamps, Gas	Thorium Nitrate
Lamps, Mercury Vapor, etc	Tungsten Manufacture
Mercury Compounds	Waste Acid Recovery
Metallurgical Investigations	Water Distillation Outfits
Molybdenum Manufacture	Zinc Chloride
Nitric Acid	
Ozonizer Construction	

More detailed information regarding the application of vitreosil to the above problems will be gladly furnished on request.

#### STANDARD EQUIPMENT

Standard forms of vitreosil equipment include the following:

**Concentrators**—Vitreosil cascade units were originally designed for the concentration of sulphuric acid

as their complete insolubility and indifference to temperature changes rendered vitreosil dishes especially adaptable to the work. The uses of cascade concentrators are, however, no longer confined to sulphuric acid, but include such materials as zinc chloride, ferric chloride and phosphoric acid. They are suitable in general for the concentration of non-volatile solutions which are corrosive due to acid content or reaction.

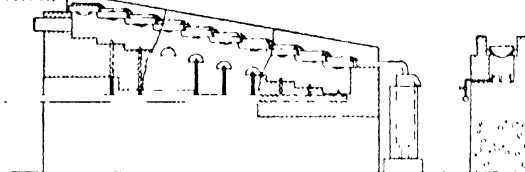


FIG. 1A CONCENTRATOR CASCADE UNIT

The above illustration shows a small unit, gas-fired to permit accurate temperature control, and especially adapted to handling moderate quantities of material of high purity. This type of apparatus is valuable for the concentration of solutions having relatively uniform boiling points throughout the range of concentration which would not permit of heating from a single source.

Vitreosil cascade concentrators can be supplied in a considerable range of capacities in single units or may be installed in a battery of units of any given capacity. This latter arrangement allows of greater flexibility of installation to meet fluctuating market conditions than if a single unit of large capacity were installed.

The vitreosil dishes are directly exposed to the fire gases so maximum efficiency is obtained with low fuel consumption. They are indifferent to temperature changes, ensuring low replacement and maintenance costs. Being entirely unaffected by the usual mineral acids, purity of product is promoted and the cost of operation is kept down. The cascade unit is very simple to operate, there being but two variables, fire and feed.

In cases where the vapors from the concentrator are not objectionable, concentration may be carried on in uncovered vitreosil cascades. Where objectionable vapors are given off, the cascade may be covered with acid proof refractories of the same material as the refractory seatings used to support the dishes over the firing flue. The fume chamber thus formed is connected by vitreosil outlet pipes to a scrubbing tower.

**Coolers**—S-bend or pot type coolers of vitreosil will withstand severer conditions of temperature change and corrosion than cooling equipment of any other material.

**Crucibles, Unglazed**—In capacities from 350 cc. to 22½ liters. Can be furnished with vitreosil cover plates ground to fit.

**Cylindrical Retorts, Pots and Linings**—In sizes up to 18" internal diameter, 30" long with one end closed and the open end either plan or socketed.

**Distilling Outfits**—Standard sets comprise retort, cover, trapped inlet tube, vapor outlet connecting tube and condensing battery of three drawn tube S-bends. As all parts are of vitreosil, the product cannot become contaminated from the equipment.

**Electrically Heated Stills**—In various capacities to order. For fine chemical manufacture.

**Electrical Immersion Heaters**—For direct heating of corrosive liquids. All parts exposed to the electric current, to high temperatures, or to corrosion, are made of vitreosil.

**Evaporating Dishes**—These are now obtainable from stock in eighteen sizes of unglazed vitreosil in capacities of 400 cc. to 22,500 cc., eight sizes of glazed non-transparent dishes in capacities of 25 cc. to 500 cc., and six sizes in the clear,

*Continued on Next Page*

transparent quality of vitreosil ranging from 25 cc. to 200 cc. in capacity.

**Fume and Outlet Pipes**—For general use in handling acids in either the gaseous or liquid state. Vitreosil pipe and connections are not attacked by condensed acid and will withstand wide temperature changes without injury. Their very light weight is an additional advantage in providing necessary supports.

Vitreosil fume and outlet pipes are especially useful in oil of vitriol plants using iron pan sets for concentration.

**Condensing Equipment**—Usually constructed on the reflux system for nitric acid and similar materials. Vitreosil condensing units consist essentially of S-bends, occupy little space for their capacity and permit of easy rearrangement when required. Other materials than vitreosil will resist chemical action successfully or will withstand direct water-cooling without injury, but vitreosil is the only condensing equipment which is entirely indifferent to both chemical and thermal conditions.

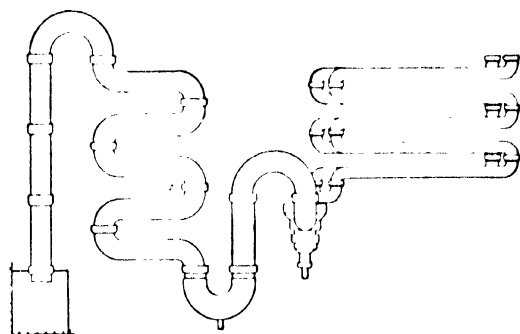


FIG. 2A REFLUX CONDENSER

**Glover Tower Outlets**—The three properties of resistance to corrosion, indifference to temperature changes and hardness combine to render vitreosil outlets for Glover towers a decided improvement over metal or earthenware.

**Hydrochloric Plant (Synthetic)**—Vitreosil tube burners for the combustion of hydrogen in chlorine and S-bend cooling sets are indispensable in the manufacture of hydrochloric acid by direct combination of the two elements. The temperatures reached in this process are of course much higher than those involved in making hydrochloric acid by the older methods, the S-bends connecting with the combustion furnace frequently operating at a visible red heat.

Vitreosil also constitutes the most satisfactory and economical form of cooling equipment for acid made by decomposing salt with sulphuric acid as water-cooled vitreosil S-bends are compact, non-porous, and unaffected by thermal or chemical conditions. We are now able to supply vitreosil absorption vessels so designed as to permit complete immersion for water-cooling.

**Niter Pot Pipes**—Vitreosil acid inlet pipes for niter pots soon pay for themselves as they eliminate the frequent renewals made necessary in the case of non or earthenware pipes by the high temperature and the corrosive action of the acid.

**Nitric Details**—In addition to our standard S-bend sets for nitric condensation, we can supply vitreosil Guttman condenser pipes, tubes and manifolds for Hart condensers, and various fittings in vitreosil for Uebel and Valentiner plants. Cooler pipes and other vitreosil details for works producing nitric acid by oxidation processes provide a form of equipment free from deterioration due to high temperatures or corrosion.

**Pipe—Plain or with one end**

**Socketed**—Carried in stock in sizes from 2" to 18" internal diameter. For conveying and cooling acid gases, manufacturing pure acids and for various special applications in the chemical and electrical industries where material is required having unusual resistance to extreme chemical, thermal and electrical conditions.

**Retorts**—In four sizes (capacities 75, 50, 15 and 3 liters

when full). For use with corrosive chemicals at high temperatures as reaction vessels, receivers, etc.

**Reaction Retorts**—The small retort shown in figure 3a is especially intended for the production of mercuric chloride by direct reaction between chlorine and mercury. This method of making corrosive sublimate has the advantages that it employs a direct synthesis from the elements, is continuous, and assures a product of great purity. These retorts furnish a convenient means for performing high temperature reactions between corrosive gases or liquids in general where the resultant product comes off as a vapor. Retort only, as shown, \$16.75 each. Tubes extra, depending on size.

**S-bend Sets**—Are especially suitable for cooling, condensation and concentration. S-bend units occupy less space than horizontal or vertical lines of straight pipes, are easily arranged for water cooling, and permit the ready removal of individual pipes without disturbing adjacent pieces. All joints are horizontal so packing is facilitated and thorough luting of the joint is certain.

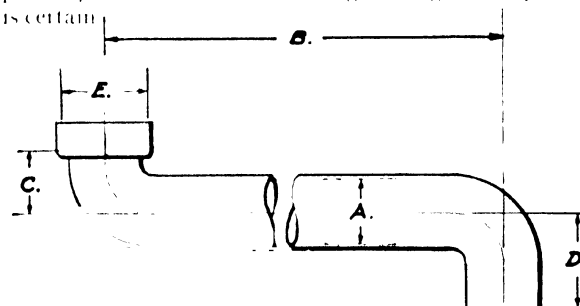


FIG. 4A STANDARD S-BENDS

No.	Dimensions—Inches					Price—Each
	A	B	C	D	E	
N 1	4	10	4 1/2	5 1/4	5 1/4	\$21.25
N 2	5	10	5	8	7	24.00
N 3	6	10	6	9	8	33.25
N 4	8	10	7	10	10 1/2	43.25
N 5	9	12	7 1/4	9 1/2	11	50.00
N 6	2	7 1/2	3 1/4	4 1/2	3 1/2	33.25
N 7	4	7 1/2	4 1/4	5 1/4	5 1/4	36.75
N 8	6	7 1/2	5 1/4	9	8 1/4	53.25

In figuring the over all height of a series of vitreosil S-bends it is necessary to allow a plus or minus variation of 1/4" from dimensions C and D given in above table.

We carry in stock a good supply of standard vitreosil S-bends with necessary vitreosil fittings.

**Steam Jets**—Vitreosil steam jets are not only non-corrodible and unbreakable with sudden changes of temperature, but owing to the hardness of fused silica, the orifice is not readily enlarged by friction.

**Tanks**—Rectangular vitreosil tanks are useful for operations involving the hot electrolysis of solutions or similar processes where the high temperatures or sudden temperature changes involved would prevent the successful use of earthenware.

**Towers—Reaction, Denitration or Absorption**—Vitreosil towers are usually supplied in sections either 12" or 15" internal diameter. They are light in weight, do not crack under temperature changes occurring in operation and are not affected in any way by contact with the usual mineral acids.

**Trays**—For drying, roasting and sintering. Vitreosil trays are especially suitable for the convenient handling of material in muffles or on hot plates. Stocked in fourteen sizes.

**Tubes for Reactions**—In either straight or S-bend form can be supplied in practically any length and in diameters up to 4 1/2 inches internal. Drawn vitreosil tubing is light in weight, possesses great regularity of wall thickness and resists perfectly either external or internal heating. These tubes can also be supplied with inset sections of the transparent tubing where visibility is desired.

**Special Equipment**—Special vitreosil apparatus is not necessarily expensive and can be supplied promptly. We shall be glad to cooperate in the design of equipment which you may need to meet unusual requirements.

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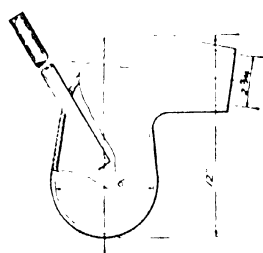


FIG. 3A REACTION RETORT

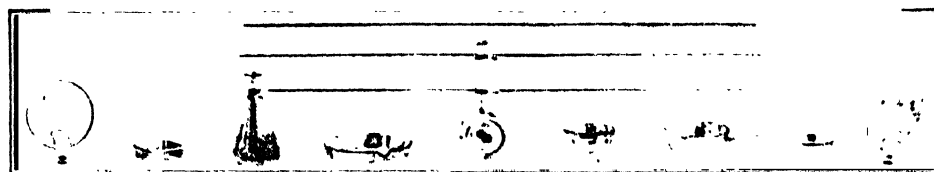


FIG. 5A TRANSPARENT VITREOSIL TUBING AND LABORATORY APPARATUS

**Catalogs**—Catalogs, price lists and blue prints covering our industrial equipment in vitreosil, glazed vitreosil laboratory ware, and transparent vitreosil tubing and utensils will be sent upon request.

### TRANSPARENT VITREOSIL

The Thermal Syndicate, Ltd., manufactures by new processes a complete line of transparent vitreosil tubes, laboratory utensils, etc. Improved methods of production enable the ware to be offered in larger sizes than formerly, and at prices very much lower than those formerly charged for transparent silica ware. At present prices it is possible to employ transparent vitreosil for practically any operation where its valuable properties would render its use advantageous.

While the prices for transparent vitreosil given on this page refer in many instances to small articles especially designed for laboratory use, they cover a variety of shapes and sizes which are applicable to industrial operations, and will afford those who are interested in the industrial application of transparent vitreosil, an indication as to approximate costs on commercial propositions.

We give below a table showing diameter, wall thickness and length of standard transparent vitreosil tubes, together with price per foot.

#### TUBES (Transparent)

Bore In	Bore mm	Max Std Wall thick- ness mm	Max Std Length (30 cm)	Price per ft. (30 cm)
1/8	1 1/2	1/2	3'	\$1.00
1/4	1 1/2	1/2	3'	1.25
3/8	3	1/2	3'	1.90
1/2	4	1/2	3'	2.15
5/8	5	1/2	3'	2.40
3/4	6	1/2	3'	2.90
7/8	7	1/2	3'	3.15
1	8	1/2	3'	3.40
1 1/8	9	1/2	3'	3.65
1 1/4	10	1/2	3'	4.00
1 1/2	11	1/2	3'	5.00
1 3/4	12	1/2	3'	6.00
2	13	1/2	3'	7.00
2 1/4	14	1/2	3'	8.00
2 1/2	15	1/2	3'	9.00
2 3/4	16	1/2	3'	9.50
3	17	1/2	3'	10.00
3 1/4	18	1/2	3'	10.50
3 1/2	19	1/2	3'	11.00
3 3/4	20	1/2	3'	12.00
4	22	1 1/2	2'0"	13.00
4 1/2	25	1 1/2	2'0"	14.00
5	30	1 1/2	1'6"	17.00

Flasks are supplied either transparent throughout or with opaque vitreosil neck and side tube and transparent vitreosil bulb. Price list of standard sizes is given below:

#### FLASKS (Round or Flat Bottom)

Capacity cc.	All Transparent		Bulb only Transparent	
	Plain Flask Price Each	Distilling Flask Price Each	Plain Flask Price Each	Distilling Flask Price Each
25	\$1.25	\$6.75	\$3.20	\$5.05
50	5.75	8.25	4.30	6.20
100	7.50	10.00	5.65	7.50
150	8.75	11.25	6.55	8.45
200	10.00	12.50	7.50	9.40
250	11.25	13.75	8.45	10.30
300	12.50	15.00	9.40	11.25
400	15.00	17.50	11.25	13.15
500	17.50	20.00	13.15	15.00
1000	30.00	35.00	22.50	26.25

Transparent vitreosil plates, on account of their translucency to ultraviolet light, are especially suitable for use as covers of vessels used as containers for chemicals reacting under the influence of the ultraviolet rays.

They are extremely useful as sight glasses for high temperature stills, retorts, etc., for which purpose they are supplied with both sides ground and polished, at a slight increase over list prices.

#### PLATES (Transparent)

Thickness Inches	Thickness mm	Maximum Area Inches	Price per Square Inch
1/8	1.5	3 X 3	\$ .65
1/4	3	3 X 3	.95
3/8	4.5	3 X 3	1.25

Large transparent vitreosil tubes now available should find extensive use in operations carried on at high temperatures under conditions where a clear view of the progress of the reaction is desired. Transparent sections may be inserted into tubes of the regular opaque quality of vitreosil, thus using the relatively expensive transparent material only where transparency is essential, but obtaining the same resistance to heat and corrosion throughout the tube.

#### TUBES, LARGE SIZES

(Transparent)

Usual wall thickness 2 1/2 to 3 mm

Bore Inches	Bore mm	Max Std Length	Price per FTCH
2	51	16"	\$1.20
2 1/4	57	16"	5.00
2 1/2	61	16"	6.00
2 3/4	70	16"	7.50
3	76	16"	8.20
3 1/4	82	12"	8.65
3 1/2	89	12"	9.05
3 3/4	95	12"	9.15
4	102	12"	9.85

A complete line of transparent vitreosil laboratory apparatus duplicating standard vitreosil shapes is carried in stock. Complete price list will be furnished on request.

**Composite Apparatus of Transparent and Non-Transparent Vitreosil**—Can be supplied not only in tube form, but in modifications of the flask and similar types of equipment at prices considerably lower than those applying to all-transparent pieces of similar size.

**Special Apparatus**—Transparent vitreosil may be worked into most of the forms in which glass is obtainable and we shall be glad to quote prices for special transparent vitreosil apparatus on receipt of sketches or specifications.

**Electrode Seals**—The insertion of electrodes into fused silica apparatus in such a way as to form a vacuum-tight connection has long been a problem of extreme difficulty confronting physical and electrical investigators. We control a patented process, available to our customers, by means of which such seals may be provided.

**Duty-Free Importations**—Our customary discount of 33 1/3% to scientific institutions, universities, etc., applies to the transparent ware also, when specially imported free of duty.

# THWING INSTRUMENT COMPANY

3348 LANCASTER AVENUE, PHILADELPHIA, PA.

New York, N. Y., Grand Central Palace  
Cleveland, O., 10412 Olivet Street  
Pittsburgh, Pa., 846 Ivy Street  
Detroit, Mich., 417 Lightner Building  
Boston, Mass., 141 Milk Street

Chicago, Ill., 342 Monadnock Block  
San Francisco, Cal., 155 Second Street  
Los Angeles, Cal., 716 South Hill Street  
Seattle, Wash., 615 Burke Building  
Toronto, Ont., 227 Davenport Road

## PRODUCTS

**Thwing Electrical Pyrometers, Indicating and Single and Multiple Recording Systems, for measuring all temperatures from  $-250^{\circ}$  C. to  $+3000^{\circ}$  C. ( $-420^{\circ}$  F. to  $+5500^{\circ}$  F.)**

## THWING PYROMETERS

A Thwing Multiple-Record Indicating and Recording Pyrometer System is a real necessity wherever heat conditions are to be measured or controlled.

The recorder in the office keeps the conditions at every heat source constantly under the manager's observation, warns of irregularities, checks inexperienced men, detects the shirkers, and gives permanent records. These records afford the best possible means

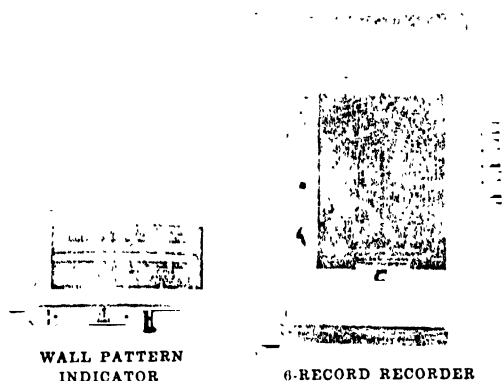
This is the quickest acting pyrometer made and is accurate to the highest temperatures. No part enters the fire nor does the operator have to get uncomfortably close to the heat. The construction is simple, practical, and very durable, and, as no focusing, leveling or reference to tables are required, readings can be taken in rapid succession.

Made for both portable and stationary use and particularly desirable for recording temperatures in furnaces, ovens, kilns, fire pits, and within moving molten metal or other material.

**Type C, Resistance**—For temperatures from  $-250^{\circ}$  to  $200^{\circ}$  C. ( $-420^{\circ}$  to  $400^{\circ}$  F.) and in special cases up to  $425^{\circ}$  C. ( $800^{\circ}$  F.).

This instrument is based upon measurement of the resistance to an electric current passing through a bulb of fine wire located at the point of temperature measurement. The resistance type is most used for measuring low temperatures where the cold ends of a thermocouple cannot easily be kept at constant temperature.

GOLD MEDAL AWARD  
PANAMA-PACIFIC EX-  
POSITION, 1915



WALL PATTERN  
INDICATOR

6-RECORD RECORDER

of determining and duplicating the ideal time and heat relation for perfect product, minimum fuel consumption, and maximum plant capacity, through completion of the process in the shortest possible time. The Thwing Multiple System of Recording produces one to twelve records on a single chart and thereby avoids the extra expense of additional instruments, charts, etc.

The indicators at the heat sources enable attendants to keep their fires right at all times to avoid losses from over- or under-heating.

Thwing Pyrometers are made in the following types:

**Type A, Thermo-Electric**—For temperatures from  $100^{\circ}$  to  $1600^{\circ}$  C. ( $200^{\circ}$  to  $2900^{\circ}$  F.).

Operation is based upon measurement of the electric current generated by insertion of the "hot point" of a thermocouple into the temperature to be measured.

The thermocouple is made of base metal or platinum with outer protection of fused quartz, porcelain, clay iron, etc., as conditions require and when installed as directed will give continuously accurate results with very low expense for renewals.

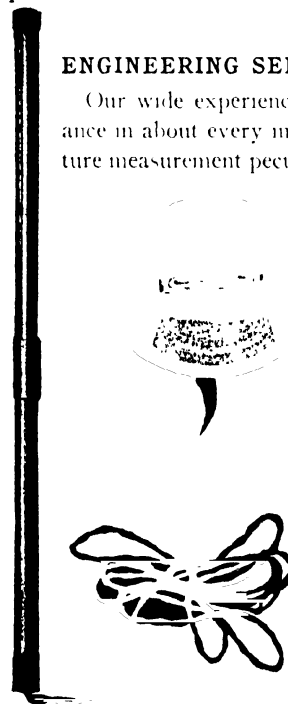
**Type B, Radiation**—For temperatures from  $500^{\circ}$  to  $3000^{\circ}$  C. ( $925^{\circ}$  to  $5500^{\circ}$  F.)

## ENGINEERING SERVICE

Our wide experience and records of performance in about every imaginable kind of temperature measurement peculiarly fit us to offer correct advice. We gladly and without charge render special reports and suggest desirable arrangements for difficult conditions.

## LITERATURE

Literature with detailed description of any type of Thwing Instrument and giving valuable hints on pyrometer selection and use will be sent free on request.



PORTABLE RADIATION  
PYROMETER

# TIPPETT & WOOD

Designers, Manufacturers and Erectors of Steel Plate Constructions

MAIN OFFICE AND WORKS: PHILLIPSBURG, N. J.

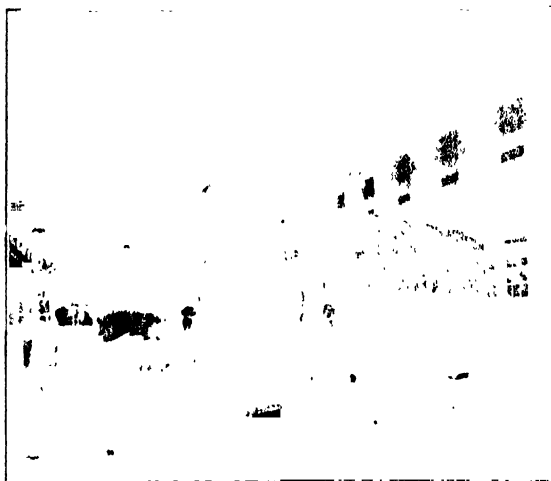
New York Office, 135 William St., New York, N. Y.

## PRODUCTS

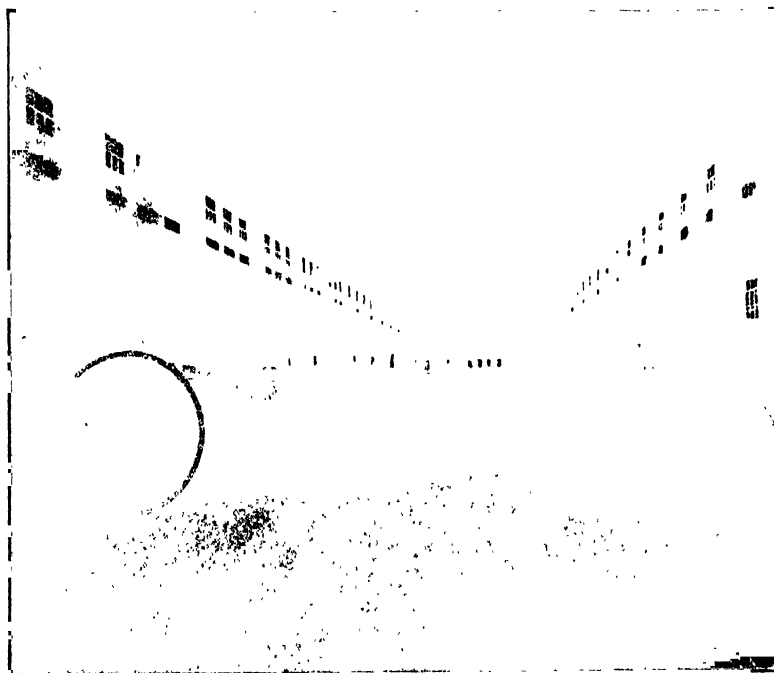
Steel tanks of every description and for all purposes. Special attention given to tanks for acids, brine, coal tar, fuel oil, gasoline, molasses, soap, etc. Standpipes, water towers, smoke stacks, breechings, flues, penstocks, riveted pipe, cylinders, boilers, condensers, ladles, hoppers, troughs, pans, dryers, receivers, bins, supports, trestles, all kinds of plate steel work and structural steel construction requiring unusual fabrication.

## QUICK SHIPMENTS

We carry a large stock of steel plates of several thicknesses from which we make tanks of a large range of diameters. For special requirements, permits to make slight substitutions from our stock and fabrication will proceed immediately. We are equipped and prepared for orders requiring concentration of effort resulting in unusually prompt completion of the work.



PATENTED SPRINKLER SERVICE TANK  
Weight 9 tons



VIEW OF ASSEMBLY SHOP

## FACILITIES

Our fifty years of experience are your benefit and assurance of proper attention and construction. Our shops, which are large and equipped with the most modern machinery, have expanded steadily during this time. We are constantly extending and installing new machinery and new methods. No work is too large for us. Send us your inquiries stating when material is required. Our engineers are at all times at your service. A catalog giving information on standpipes and water towers will be mailed upon request.

# THE TIRRILL GAS MACHINE LIGHTING COMPANY

Established 1864

Manufacturers of Gas Machines and Gas Specialties  
HUDSON TERMINAL BUILDING, 50 CHURCH ST., NEW YORK, N. Y.

## PRODUCTS

Tirrill Gas Machines, Testing Stoves, Bunsen Burners, Laboratory Burners, Mixing Valves, Gas Stoves, Hot Water Heaters, Tirrill Underground Gasoline Storage Tanks, etc.

### THE TIRRILL EQUALIZING GAS MACHINE

For Laboratory, Industrial Chemical, Cooking and Heating Purposes.



The Tirrill Installation has the approval of Underwriters - does not affect insurance rates. The only machine made which mixes the gas outside of the building.

## DESCRIPTION

The Tirrill "Equalizing" Gas Machine consists of three principal parts:

(a) The **Air Pump or Meter**, which is usually placed in the cellar of the building and operated by a suspended weight, or water wheel, if preferred. It is partly filled with water, the balance of its contents being air. It can be placed next to a furnace. No gas even enters this part of the machine. It produces the pressure to generate the gas and send it back to the pipes, ready for instant use. A constant and perfect pressure is assured. The machine operated by a suspended weight requires no more bother or effort than is necessary to wind an ordinary clock. Requires no running water. The water wheel operates automatically by water, using water only in exact proportion to the quantity of gas consumed.

(b) The **Gas Generator**, buried in the ground, 30 ft. from the building, contains all the gasoline. Requires filling but once or twice a year. Requires no vault of any kind. Inside the Generator is the Carburetor which floats on the top of the gasoline. The Carburetor mixes the air with the gasoline vapor and thus makes the gas. It is so constructed that it presents the largest possible evaporating surface of proved efficiency.

(c) The **Mixer** is buried in the ground near the generator. Its function is to take the gasoline vapor from the generator and thoroughly mix or "equalize" it with a given quantity of air, thus insuring that all gas drawn from it for consumption at the burners will be smokeless, uniform and of a standard quality. It is the only process which insures perfect combustion. Requires no attention.

The Air Pump or Meter, the Gas Generator and the Mixer are all constructed of the best quality cold rolled, Galvanized Bessemer Steel material. All seams and joints are thoroughly and carefully tested throughout by skilled experts. Furnished with two coats of the best, non-corrosive, asphaltum paint.

**TIRRILL "EQUALIZING" GAS MACHINES ARE MADE IN THE FOLLOWING STANDARD SIZES**

Size of Machine	Number of Burners or Lights	Capacity of Gas Generator	Size of Machine	Number of Burners or Lights	Capacity of Gas Generator
No. 1	15 to 25	3 bbls	No. 5	200	10 bbls
No. 2	50	4 bbls	No. 6	300	14 bbls
No. 3	75	5 bbls	No. 7	500	25 bbls
No. 4	100	6 bbls	No. 8	1,000	50 bbls

Prices upon application.

If you want Perfect Gas Service at Minimum Cost, send for our specification.

To determine proper capacity machine required state

Maximum gas requirement per hour when known.

Number of lights or burners or both, specifying type.

Other appliances to be used, industrial, heating or domestic.

## TIRRILL BURNERS

Tirrill burners have been recognized for fifty years as the standard burners for chemical and industrial plant laboratories. No other burner on the market will give the service and the economical high heat that this Tirrill burner will. Many "Tirrill type" burners are sold; but no burner is a **genuine Tirrill** unless guaranteed made by us and having the name "Tirrill" on it. Look out for imitations.



NO. 2600  
Price \$1.25

### Tirrill Laboratory Bunsen Burner No. 2600

This type of burner finds universal application in the Chemical Laboratory. It is easy to adjust to any desired intensity of heat. It is made with separate air and gas adjustment, thus yielding wide range of temperatures. They work successfully with city, natural or gasoline gas.

Another type of the Improved Laboratory Bunsen Burner is made to regulate the supply of air and gas at the same time. When ordered without the stand, the burner is made with a standard 1/4" pipe thread.

Price, No. 2500 . . . . . 85 each

### Tirrill Blast Flame Heating Burner

This burner will deliver a heat of 2000°F. It is regulated with one movement and without burning the operator's fingers.

**Tirrill Rose Heating Burner**—Made in two sizes. The 2" size is good where a moderate heat is required in laboratory work.  
2" Size, Price \$2.50

NO. 2000  
Price \$1.00

The 5" size is made for industrial work such as heating autoclaves, etc. It can also be used under air and gas pressure.  
5" Size, Price \$7.50

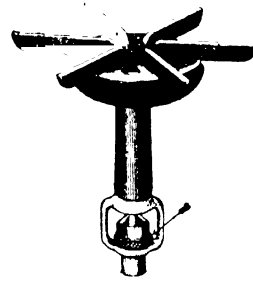
**Tirrill Industrial Heating Burner, Diameter 16 Inches**—This burner has lately attained a wide use in the Industrial Laboratories, where batches of 5 gallons or more are made. Can be used as an atmospheric burner or arranged to work under air and gas pressure. Price with 2" mixing valve, \$35.00.

Furnished with air and gas adjusting cock without mixing valve—prices according to size.

**Tirrill Adjustable Laboratory Heating Burner**—Designed with flat circular plate having exit ports for the gas in the rim of the plate. This allows for a large heated area, and delivers more heat with less gas than any other burner made.

Used for cooking and Domestic Science work.

Price No. 2800 with stand . . . . . \$3.00 each  
Price No. 2700 without stand . . . . . 2.50 each



NO. 2700

## TIRRILL COMBINATION MIXING VALVES



### TIRRILL COMBINATION MIXING VALVE

1/4" valve without lever cock, \$1.25  
1/4" " with " " 1.50  
1" " " " 3.00  
2" " " " 15.00

These valves regulate the air and the gas at the same time, for hot plates, stills, sterilizers, autoclaves, warming closets, blast furnaces, gas fuel heating appliances, ovens, water heaters, hot plates and gas ranges.

Prices subject to change.

# THE TOWNSEND FURNACE AND MACHINE SHOP CO.

ALBANY N. Y.

Established 1807

## PRODUCTS

**Evaporating Pans; Indigo Grinders; Spheroidal Grinding Mills; Sulphonating Kettles; Nitrating Kettles; Cast Iron Acid Eggs; Filter Presses; Acetone Kettles; Potash Kettles.**

## MIXING PANS

This worm driven pan is 78" inside diameter by 20" deep. The bottom and sides are machine finished. The mixer blades are arranged so as to give the best results, it being impossible for the material to get by without being thoroughly mixed.



MIXING PAN

## EVAPORATING PANS

Several different forms and designs of these pans have been experimented on and it has been found expedient to use this particular type to obtain the required results. Inside dimensions are 6' 6" long by 41" wide.

## KETTLES

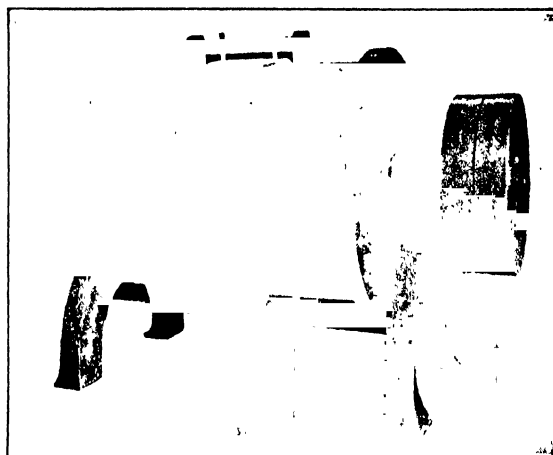
We use a mixture of cast iron in all of our Chemical Castings which was obtained after careful experiments in practical use. The result is a greatly extended life and, therefore, greater efficiency of our kettles which are used for Nitrating, Sulphonating, Acetone and Shells for acid eggs. The combined quality of our castings and this special mixture of cast iron shows itself by the satisfaction it is giving to our ever increasing list of customers.

## PRESSES

We are now manufacturing two different size presses 24" x 24" and 32" x 32", being 12 ft. between the heads. We have already sold a quantity of these which are doing efficient work. They are so well known to the trade as to need no further description.

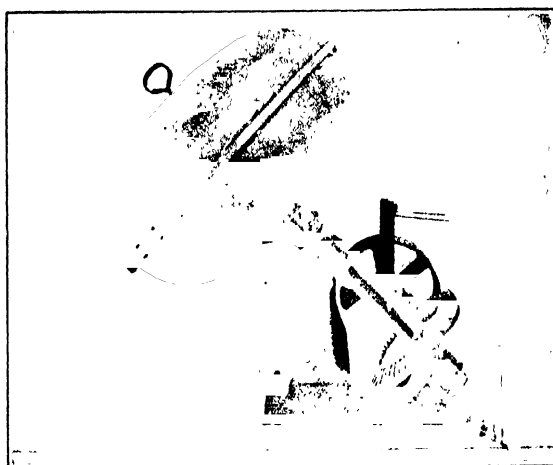
## MILLS

Our standard line of Indigo or Grinding Mills are made in three sizes: 26" diameter by 36" long, 32" diameter by 42" long, and 38" diameter by 45" long. Each size is fitted with two hand holes, one being on



CYLINDRICAL MIXING AND GRINDING MILL

the end and the other in the center of the barrel, the cover of which is easily removed. These mills are mounted on good substantial frames which make them rigid. Sufficient cast iron balls are furnished with each outfit.



SPHEROIDAL MIXING AND GRINDING MILL

Our Spheroidal Mills are very popular with Dye Manufacturers judging by the quantity we are selling. They are very efficient and compact machines, the results obtained being highly satisfactory. Made in two sizes: 30" diameter by 15" and 42" diameter by 22".

# TOLEDO SCALE COMPANY

## Largest Automatic Scale Manufacturers in the World

### TOLEDO, OHIO

CANADIAN TOLEDO SCALE CO., LIMITED, WINDSOR, ONTARIO

199 Sales Branches and Service Stations in stock in the United States and Canada. Others in thirty-four foreign countries.

#### PRODUCTS

Automatic Dial Scales of the following types for weighing, computing, counting, testing and checking purposes, and other special operations; Counter, bench, portable, dormant, built-in, monorail, tank and truck scales.

#### TOLEDO SPRINGLESS INDUSTRIAL SCALES, AUTOMATIC AND INSTANTANEOUS

Tons may now be weighed with the same speed as pounds. Instantly indicating correct weight on their easily-read, clock-faced dials, Toledo Scales make accuracy of heavy weighing automatic and uniform, instead of its being dependent upon the patience and skill of the individual operator.

In fact, wherever you find progress and leadership in any line of industrial endeavor, there you find Toledos have replaced the old beam types and weighing is now an automatic operation. With Toledos all you do is roll the load on the platform, glance at the big figures on the dial, the job is done.

Toledo Scales safeguard profits, speed up production, simplify factory problems, prevent waste and facilitate shipping. They are rugged, simple in operation and always reliable.

#### SPECIAL OPERATIONS

The Toledo Industrial Scale is more than merely a fast automatic weighing machine - its uses for special operations in factories are numerous and important.

Besides Toledo Automatic Scales for general weighing purposes there are Toledos for compounding mixtures, for measuring liquids, for determining coal or oil consumption, for measuring horsepower produced; for testing tensile strengths, for determining moisture content, for packing predetermined quantities of materials in containers, for counting quantities of small uniform or duplicate items; for determining the weight of fabrics per square or running yard in ounces; for grading seeds and grains, and for solving many other perplexing problems of testing and measurement in all kinds of industrial plants.

Detailed information concerning the uses and applications of Toledo Scales, and their exclusive features and construction will be given on request.

#### ENGINEERING DEPARTMENT

The Toledo Scale Company makes springless automatic scales and nothing else. Its entire staff of highly skilled scale engineers and factory experts devote their whole time and attention to the building of automatic scales. Their knowledge, skill and services are always available for the solution of weighing, measuring, counting and checking problems.

#### SERVICE DEPARTMENT

All Toledo Scales are backed by an efficient Service organization which insures Toledo users prompt service at all times in case of accident, or whenever a skilled scale mechanic is required.

#### A FEW TYPES OF TOLEDO SCALES

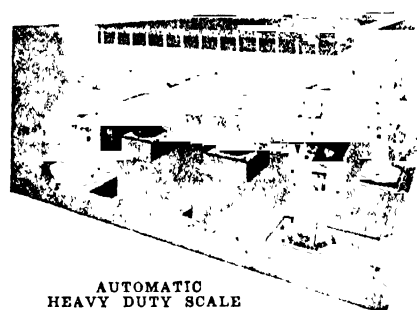


**AUTOMATIC SELF-CONTAINED  
HEAVY DUTY SCALE**

The Toledo Automatic Heavy Duty scale of the built-in type similar to the illustration is furnished in capacities ranging from 6 to 30 tons, with platform sizes running

from 5 ft  
x 5 ft to 22  
ft x 9 ft.

The dial is  
28 inches  
in diameter at the  
reading line



**AUTOMATIC  
HEAVY DUTY SCALE**



**TOLEDO NO. 605**

The Toledo No. 605 is the smallest scale in the Toledo line. Maximum capacity is 3 lbs., choice of many charts, for fine accurate weighing, checking and compounding. Graduations permit readings as fine as 1/16 oz. on certain charts. Special charts and equipment supplied when necessary.

The Toledo Automatic Hanging Scale is built in three capacities: 50 lbs., 100 lbs., and 150 lbs., with graduations as fine as 1/10 lb. The scale is hung from a swivel hook which permits its facing in any convenient direction. Choice of equipment is as follows: square galvanized pan, as shown, galvanized scoop; commodity hook; tire hook; round porcelain bowl; and galvanized lap for weighing cotton.



**AUTOMATIC  
HANGING  
SCALE**

*Continued on Next Page*





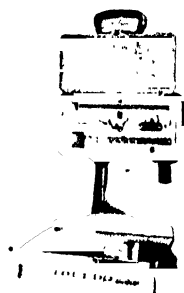
TOLEDO NO. 682 TYPE SCALE

Used in compounding chemicals and rubber at the McGraw-Tire and Rubber Co.



TOLEDO 800 TYPE PORTABLE SCALE

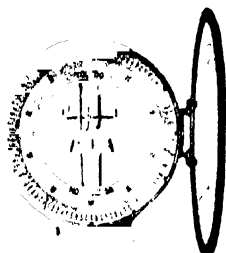
At the Standard Varnish Company, New York, weighing barrels of varnish and oils.



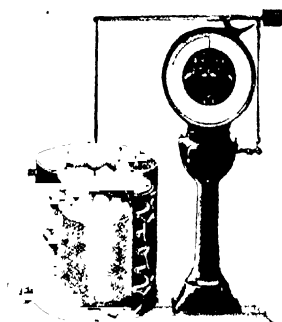
TOLEDO NO. 692 COMPOUNDING SCALE

The Toledo No. 692 compounding scale has two beams in an enclosed cabinet with a hinged door. One beam has a capacity of 2 lbs. and is graduated to  $\frac{1}{4}$  oz.; the other beam is of 24 lbs. capacity graduated to 2 lbs. or can be increased to 50 lbs. if necessary. The chart has but one graduation in the center. By setting the poises on the beams at the weight desired the scale makes possible extremely rapid weighing to this predetermined mark.

The Toledo compounding dial can be furnished on any of the Toledo scales having 20" dials. At the extreme outer edge of the dial is a circular metal band on which are movable indicators numbered consecutively to represent the ingredients being weighed.



TOLEDO COMPOUNDING DIAL



TOLEDO MOISTURE SCALE

The Toledo Moisture Scale was designed to compute the percentage of moisture contained in raw wool and similar materials. The material is placed in a drying tank and is suspended from the scale which registers 100% before drying, indicating in terms of % the shrinkage as the material is dried out.

represent the ingredients being weighed. The scroll is hinged to permit the setting of these indicators to correspond to the amount of each ingredient called for in the compound.

The Toledo Moisture



AUTOMATIC PORTABLE SCALE

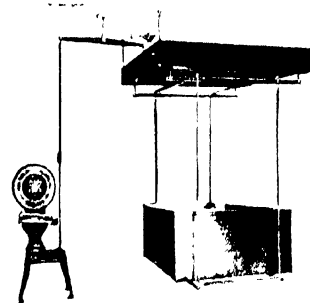
Toledo Automatic Portable Scale is furnished in capacities from 100 to 1500 pounds. It is supplied without beams, with tare beam only, or with both tare and capacity beams. Dial, which is 20" in diameter at reading line, may face platform or may be at right angles to it, or may be on opposite side. Long column as shown, measures 37"; short column for bench work measures 20". Scale is furnished with or without wheels, platform sizes 21 x 20", or 21 x 14".

The Toledo self-contained single column dormant scale is built in capacities from 250 to 3800 pounds, with or without tare and capacity beams, as desired. Dial is 20" in diameter at reading line. Platforms run in eight sizes from 46 x 33" to 76 x 54".

Toledo Suspended Lever Tank Scale single column style head has an extreme



TOLEDO SELF-CONTAINED SINGLE COLUMN DORMANT SCALE



TOLEDO SUSPENDED LEVER TANK SCALE

capacity of 2500 lbs. With the cabinet head shown in our 1541 type scales the maximum capacity is 6250 lbs. A platform may be substituted for the tank. Overhead levers may be supported on posts from floor, or hung from ceiling.

# TOLHURST MACHINE WORKS

TROY, N. Y.

NEW YORK OFFICE 111 Broadway

WESTERN  
REPRESENTATIVE

John S. Gage  
Hartford Bldg  
Chicago, Ill.

CANADIAN  
REPRESENTATIVE

W. J. Westaway Co.  
Macn & McNab, Sits  
Hamilton, Ont.

For McGrath Bldg  
Montreal, P. Q.

SOUTHERN  
REPRESENTATIVE

Ernest H. White  
Realty Bldg  
Charlotte, N. C.

SAN FRANCISCO  
REPRESENTATIVE

R. M. Pillsbury  
512 Merchants Exchange Building  
San Francisco, Calif.

## PRODUCTS

Tolhurst Centrifugals and Extractors of all types and for all purposes.

Acid Wringers  
Bottom Discharge Centrifugals  
Center-Slung Centrifugals  
Chip Wringers  
Dehydrating Centrifugals  
Extractors  
Finishing Centrifugals  
Hydro-Extractors  
Laboratory Centrifugals  
Metal Dryers  
Nitrating Centrifugals  
Oil Extractors  
Self-Balancing Centrifugals  
Solid Curb Centrifugals  
Suspended Centrifugals

## GENERAL SPECIFICATIONS

**Baskets**—12 inches to 72 inches inside diameters, with or without bottom discharge.

May be made of iron and steel or bronze and copper, etc., or covered with hard rubber or coated with lead, tin, etc.

**Cases**—Of cast iron or iron and steel. May be lined with sheet lead, hard rubber, etc.

**Bearings**—The different types of centrifugals require various bearings; some roller type, others ball type. All are flexibly mounted to insure smoothness of operation, durability of bearings and safety.

**Drive**—By countershaft, engine or motor.

## SELF-BALANCING CENTRIFUGAL

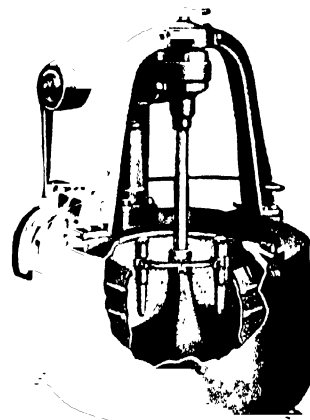
Illustration shows a Tolhurst Centrifugal installed in a well-known Chemical Plant.



**TOLHURST SELF-BALANCING CENTRIFUGAL**  
**Baskets**—26 to 72 inches diameter with or without bottom discharge. Countershaft, motor or engine drive or by direct connected vertical motor.

## LABORATORY CENTRIFUGAL

Specially designed for centrifugal determinations and scientific research. The Tolhurst 12" laboratory centrifugal is equipped, if desired, with test tube holders and perforate baskets for clarification. The basket is large enough (12 inches diameter) to permit the centrifuging of a thick cake, therefore results are comparable with those obtained in the large commercial size centrifugals.



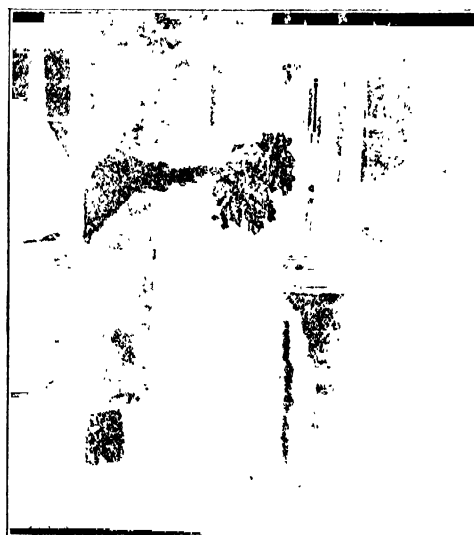
**TOLHURST LABORATORY CENTRIFUGAL**

## LABORATORY INVESTIGATIONS

We make laboratory investigations of centrifugal problems without charge.

## CENTER-SLUNG CENTRIFUGAL

An accessible, open-top machine which does not dance in the supporting links, because these links are attached at or near the center of gravity and in line



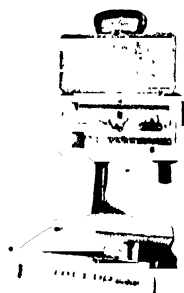
**TOLHURST CENTER-SLUNG CENTRIFUGAL**  
**Baskets**—10 and 18 inches inside basket diameters, with or without bottom discharge. Drive by countershaft or motor or by direct connected vertical motor.

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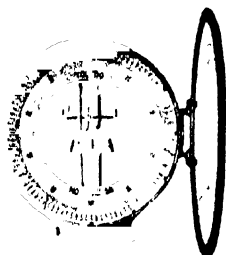
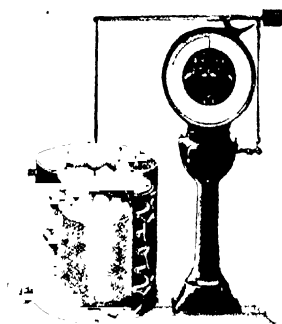
TOLEDO NO. 682 TYPE SCALE

Used in compounding chemicals and rubber at the McGraw-Tire and Rubber Co.

TOLEDO NO. 682 COM-  
POUNDING SCALE

The Toledo No. 682 compounding scale has two beams in an enclosed cabinet with a hinged door. One beam has a capacity of 2 lbs. and is graduated to  $\frac{1}{4}$  oz.; the other beam is of 24 lbs. capacity graduated to 2 lbs. or can be increased to 50 lbs. if necessary. The chart has but one graduation in the center. By setting the poises on the beams at the weight desired the scale makes possible extremely rapid weighing to this predetermined mark.

The Toledo compounding dial can be furnished on any of the Toledo scales having 20" dials. At the extreme outer edge of the dial is a circular metal band on which are movable indicators numbered consecutively to represent the ingredients being weighed.

TOLEDO COMPOUNDING  
DIAL

TOLEDO MOISTURE SCALE

The Toledo Moisture Scale was designed to compute the percentage of moisture contained in raw wool and similar materials. The material is placed in a drying tank and is suspended from the scale which registers 100% before drying, indicating in terms of % the shrinkage as the material is dried out.

represent the ingredients being weighed. The scroll is hinged to permit the setting of these indicators to correspond to the amount of each ingredient called for in the compound.

The Toledo Moisture



TOLEDO 800 TYPE PORTABLE SCALE

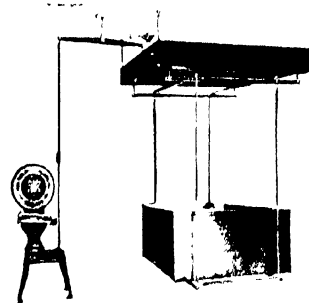
At the Standard Varnish Company, New York, weighing barrels of varnish and oils.

AUTOMATIC  
PORTABLE  
SCALE

Toledo Automatic Portable Scale is furnished in capacities from 100 to 1500 pounds. It is supplied without beams, with tare beam only, or with both tare and capacity beams. Dial, which is 20" in diameter at reading line, may face platform or may be at right angles to it, or may be on opposite side. Long column as shown, measures 37"; short column for bench work measures 20". Scale is furnished with or without wheels, platform sizes 21 x 20", or 21 x 14".

The Toledo self-contained single column dormant scale is built in capacities from 250 to 3800 pounds, with or without tare and capacity beams, as desired. Dial is 20" in diameter at reading line. Platforms run in eight sizes from 46 x 33" to 76 x 54".

Toledo Suspended Lever Tank Scale single column style head has an extreme

TOLEDO SELF-CONTAINED  
SINGLE COLUMN DOR-  
MANT SCALETOLEDO SUSPENDED LEVER TANK  
SCALE

capacity of 2500 lbs. With the cabinet head shown in our 1541 type scales the maximum capacity is 6250 lbs. A platform may be substituted for the tank. Overhead levers may be supported on posts from floor, or hung from ceiling.

# TRENT TILE CO., INC.

Manufacturers of  
Floor, Wall and Trim Tile of Every Variety  
TRENTON, NEW JERSEY

## PRODUCTS

White Glazed Wall Tile and all necessary Trimmers.

Ceramic Mosaic Floor Tile in white and all colors.

## FLOOR, WALL AND TRIM TILE

We are Pioneer Manufacturers of Tile in the United States, and we are original manufacturers of Ceramic Mosaic Floor Tile in white and all colors.

## USES

Owing to the adaptability and long life of our Glazed Tile products in Industrial plants, they are finding widely increasing and divergent applications. Modern Manufacturing Laboratories and Research Laboratories are built for permanence, and floors built with our Ceramic Mosaic Floor Tile will be clean, resist corrosion, be leak-proof and will last as long as the building. The walls of laboratories lined with our White Glazed Wall Tile and Trimmers are always bright, easily cleaned of dust and chemical stains, are not attacked by corrosive liquids, and are non-conductors.

Trent Tile is being used for lining vats in chemical plants where the products must have thorough sanitary surroundings during processing. Among these products are Foods, Pharmaceuticals, Cosmetics, Fruit Juices, Patent Medicines, etc.

Trent Tiles are also used for Factory Libraries, Lunch Rooms, Rest Rooms, Wash Rooms and Lavatories.

## EASE OF CLEANING

Trent Tile can be cleaned in a very short time, in

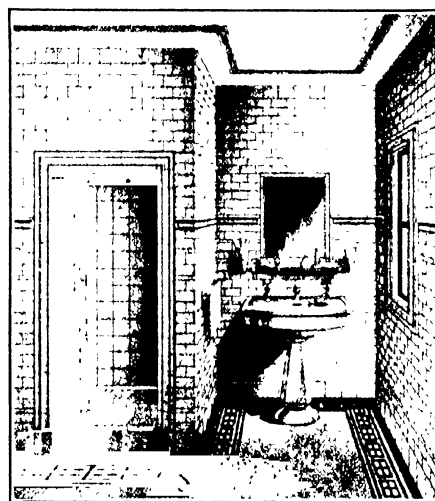
exactly the same manner as glass, therefore it always appears as when first installed.

## SHAPES

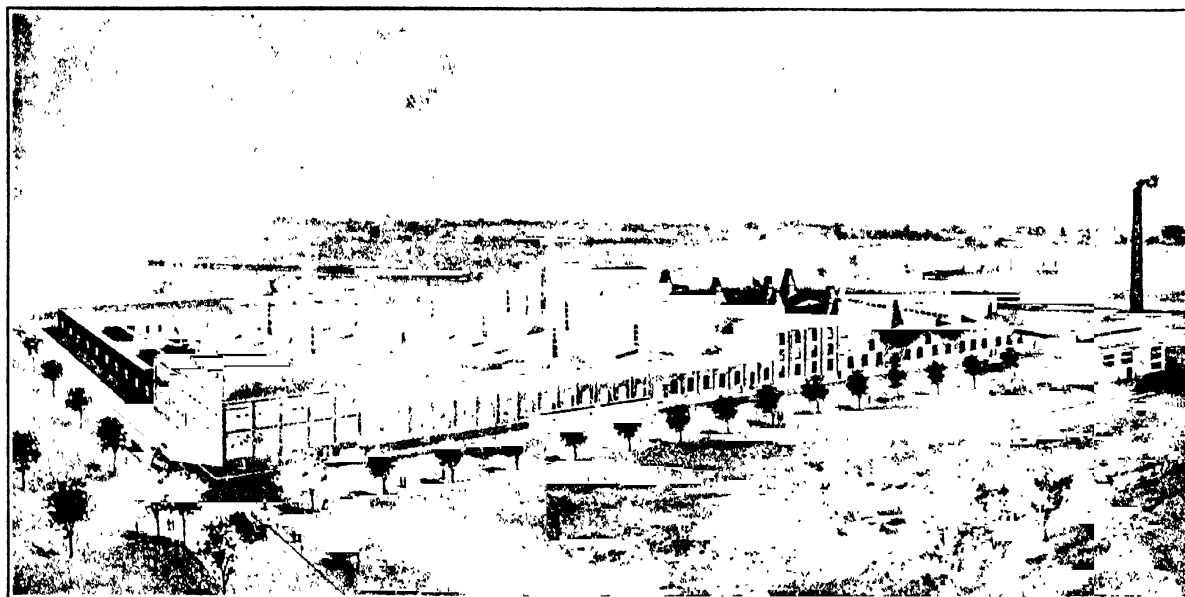
Our tile is furnished in all shapes; flats, squares, oblongs, cove and base, in and out corner, etc., in fact any shape or style required to line a tank or vat, finish a laboratory, lavatory, entry, kitchen, etc.

## INSTALLATIONS

The Trent Tile Co., Inc., has furnished the Floor and Wall Tile for the Standard Oil Co.'s different refineries, office buildings, etc., throughout the United States. We have also furnished tile for other chemical industrial plants for various purposes.



A MODERN FACTORY WASHROOM  
Shower 6 x 6 tiles, Walls 6 x 3 tiles



PLANT OF THE TRENT TILE CO., INC.



# THE TRUSCON LABORATORIES

HOME OFFICE AND FACTORY

DETROIT, MICH.

BRANCHES IN ALL PRINCIPAL CITIES



## PRODUCTS

Waterproofings and Dampproofings; Concrete Floor Hardeners, Acid-Resisting Paints, and Technical Paints and Enamels for a great variety of purposes.

## WATERPROOFING AND DAMPPROOFING

Truscon Waterproofing Paste, Concentrated, is an integral waterproofing for concrete. While very generally used for waterproofing concrete foundations, tunnels, reservoirs, etc., it is also desirable for protecting other forms of masonry constructions, such as brick or stone, against hydrostatic head. (See specifications below.)

Truscon Waterproofing Paste has won its position in the field because it is the perfected waterproofing from a practical engineering point of view. Furthermore, it is the most economical waterproofing to use, it is concentrated; less material is required. Consequently it costs less per cubic yard of concrete.

**Specifications**—For waterproofing mass concrete by integral method

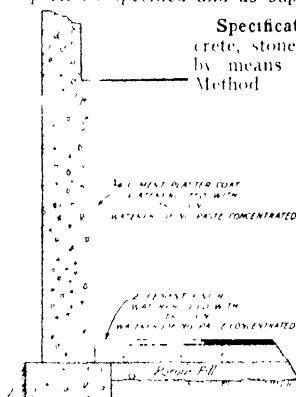
Applicable to cisterns, reservoirs, foundations and similar concrete structures

**Method**—Watertightness shall be secured by the addition of Truscon Waterproofing Paste, Concentrated, as manufactured by The Truscon Laboratories, to all water used to temper the dry mixture of cement and aggregate in the proportions specified and as supplied by the manufacturer.

**Specifications**—For waterproofing concrete, stone and other masonry structures by means of Waterproofed Plaster Coat Method

Applicable to cisterns, reservoirs, basement walls, subways and similar structures

**Method**—Watertightness shall be secured by plastering the interior surfaces of the structure with a continuous coat of Portland Cement mortar waterproofed with Truscon Waterproofing Paste, Concentrated, as manufactured and recommended by The Truscon Laboratories



DETAILS PLASTER COAT METHOD

**Truscon Plaster Bond**—A special bituminous coating for waterproofing interiors of all exposed walls. Its use provides a continuous dampproofing element in all such walls which perfectly insulates the interior from any evidence of dampness. On application to the surface it is partly absorbed into the pores, thoroughly sealing them and establishing a most inseparable bond.

**Truscon Foundation Coat**—A liquid bituminous cement of heavy consistency adapted for dampproofing general substructural work under earth filling.

**Truscon Stone Backing**—A black dampproof coating for treating the unexposed sides of cut stone, thereby preventing discoloration of the stone from elements in the mortar.

## TRUSCON MAINTENANCE ENGINEERING SERVICE

TRADE-MARK OF MAINTENANCE DEPARTMENT

### "A MAINTENANCE PRODUCT FOR EVERY MAINTENANCE PURPOSE"

Every manufacturing Plant, every Office Building, Hotel, Hospital, Apartment Block, etc., has a definite problem in its maintenance or up keep. Interiors must be painted—exteriors must be protected against deterioration—and there is much varnishing and cleaning up to be done. On account of the exceptional manufacturing facilities of the Truscon Laboratories and our experience in handling such Maintenance Requirements, we are in a position to offer every Architect, Engineer, Building or Plant Superintendent, a valuable Service.

Whether your problem is that of oilproofing a concrete floor, splinterproofing a wood floor, obtaining a special paint to resist some acid or alkali condition, waterproofing a basement, or protecting exposed steel, Truscon Maintenance Engineering Service has a product for that, and every other, Building Maintenance purpose.

Below we enumerate a few standard Truscon products and their particular uses. These are suggestive and we ask that you bear in mind that Truscon Maintenance Engineering Service does not merely furnish Maintenance materials, but is a Service which extends an intelligent, cooperative assistance that results in money saved on your Maintenance Requirements.

**Dustless Long-wearing Concrete Floors**—are possible with "Agatex," a chemical which hardens the concrete without changing its color or appearance.

**Increasing Lighting Efficiency**—Nothing does so much toward cutting down electric lighting bills as the use of a serviceable Mill White, such as Truscon "Industrial White." It stays white. It is more economical and advantageous than kalsomine.

**Wood Floors do not Splinter or Sliver**—if protected with "Truscon Wood Floor Preservative." Gives new life and toughness to a wood floor. Prevents decay and dry rot.

**Non-rusting Steel Surfaces**—"Bar-Ox Inhibitive Coating" is the coating that should be used on all exposed Steel, such as bridgework, cranes, outdoor tanks, etc., for both shop and field coats

**Protecting Masonry**—is perfectly feasible with "Stonetex," the Nationally known masonry coating. It dampproofs, protects and beautifies all such surfaces.

**Skylight and Window Cleaner**—for easy cleaning of soot, rust and grime from glass. Especially useful when applied to ribbed glass. Does not injure the paint or putty.

**Truscon Pipe Identification Paint**—For Painting the various pipes running along the walls and ceilings of an Industrial Plant in distinctive colors. Obtainable in a standard line of colors for water, gas, steam, oil, compressed air and other pipe lines.

# TROY ENGINE & MACHINE COMPANY

Manufacturers of Steam Engines Exclusively

TROY, PA.

## PRODUCTS

Troy Vertical Automatic Engines.

Troy Horizontal Automatic Engines.

Troy Vertical Throttling Engines, High and Low Pressure Types.

Troy Horizontal Throttling Engines, High and Low Pressure Types.

## HORSE-POWER

Troy Steam Engines can be supplied in capacities from 2 to 200 Horse-power. The ratings given in our tables are not indicated powers, but brake powers, or the net effective powers delivered at the belt or the shaft coupling.

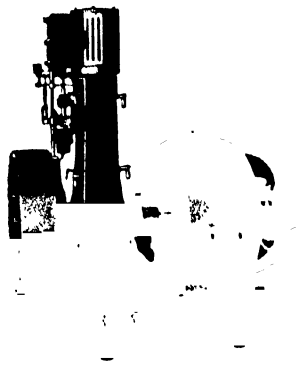
## FACILITIES AND EXPERIENCE

Troy Steam Engines are the result of over 28 years' experience in engine building. Our plant is located near the Pennsylvania iron and coal fields, where raw material is most favorably secured. We endeavor to keep all classes of engines made by us in stock in all standard sizes for prompt shipment.

**Engines for Chemical Industries**—We have supplied many engines for driving pumps, blowers, fans, mixers, dryers, centrifugals, generators and similar equipment in chemical plants, by-product coke plants, etc. Our experience in this line should be of value to chemical engineers and we will be pleased to advise regarding the best type of engine for any such purpose.

## TROY VERTICAL AUTOMATIC ENGINES

These engines run at a constant speed determined by the Rites Inertia Governor, with which they are equipped. They are self-oiling, with enclosed frame, or cup lubrication. Arranged for belt drive with two wheels or for direct connection with extension base. Speed adjusted at standard number of revolutions, as per table, unless otherwise ordered. All fittings of best grade.



VERTICAL ENGINE DIRECT-CONNECTED TO GENERATOR

## TROY VERTICAL AUTOMATIC ENGINES

Specifications for Enclosed, Self-Oiling or Cup Lubrication

Cyl- inder	Revol- utions	Brake horse-power 1/4 cut-off	Gov. wheel and driving pulley	Shaft	Pipes	Floor space, inches	Approx shipping weight
Diameter Stroke	Lowest Standard Highest	100 lbs. press. 300 revs. One lb. press. One rev.	Diameter Face Weight of wheel	Diameter Length	Supply Exhaust	Belted engine two wheels Belted engine two wheels D.C. engine extended base	
3 1/2	4 1/2	100 100 100	12 1/2	1 1/2	1 1/2	20x33	750 950
4 1/2	5 1/2	100 100 100	16 1/2	2 1/2	2 1/2	24x33	950 1150
5 1/2	6 1/2	100 100 100	20 1/2	3 1/2	3 1/2	31x33	1350 1650
6 1/2	7 1/2	100 100 100	24 1/2	4 1/2	4 1/2	31x33	1900 2200
7 1/2	8 1/2	100 100 100	28 1/2	5 1/2	5 1/2	31x33	2500 2750
8 1/2	9 1/2	100 100 100	32 1/2	6 1/2	6 1/2	31x33	3000 3200
9 1/2	10 1/2	100 100 100	36 1/2	7 1/2	7 1/2	31x33	3500 3700
10 1/2	11 1/2	100 100 100	40 1/2	8 1/2	8 1/2	31x33	4000 4200
11 1/2	12 1/2	100 100 100	44 1/2	9 1/2	9 1/2	31x33	4500 4700
12 1/2	13 1/2	100 100 100	48 1/2	10 1/2	10 1/2	31x33	5000 5200
13 1/2	14 1/2	100 100 100	52 1/2	11 1/2	11 1/2	31x33	5500 5700
14 1/2	15 1/2	100 100 100	56 1/2	12 1/2	12 1/2	31x33	6000 6200

(Horse-power based upon 400 R. P. M.)

## TROY HORIZONTAL AUTOMATIC ENGINES

Two methods of lubrication, self-oiling or tank gravity system. Steam pressures, 60 to 160 pounds, special cylinders built for higher pressures. Sub-base is used with self-oiling engines as it contains the oil reservoir and some fittings. Full equipment. Speed and direction of rotation should be specified.

## HORIZONTAL AUTOMATIC ENGINE

### TROY HORIZONTAL AUTOMATIC ENGINES

Specifications for Enclosed, Self-Oiling or Tank Lubrication

Cyl- inder	Revol- ution	Brake horse-power 1/4 cut-off	Gov. wheel and driving pulley	Shaft	Pipes	Floor space, inches	Approx shipping weight
Diameter Stroke	Lowest Standard Highest	100 lbs. press. 300 revs. One lb. press. One rev.	Diameter Face Weight of wheel	Diameter Length	Supply Exhaust	Belted engine two wheels Belted engine two wheels D.C. engine extended base	
7 1/2	8 1/2	100 100 100	12 1/2	1 1/2	1 1/2	20x33	750 950
8 1/2	9 1/2	100 100 100	16 1/2	2 1/2	2 1/2	24x33	950 1150
9 1/2	10 1/2	100 100 100	20 1/2	3 1/2	3 1/2	31x33	1350 1650
10 1/2	11 1/2	100 100 100	24 1/2	4 1/2	4 1/2	31x33	1900 2200
11 1/2	12 1/2	100 100 100	28 1/2	5 1/2	5 1/2	31x33	2500 2750
12 1/2	13 1/2	100 100 100	32 1/2	6 1/2	6 1/2	31x33	3000 3200
13 1/2	14 1/2	100 100 100	36 1/2	7 1/2	7 1/2	31x33	3500 3700
14 1/2	15 1/2	100 100 100	40 1/2	8 1/2	8 1/2	31x33	4000 4200

## UTES INERTIA GOVERNOR

This device is incorporated with all our Automatic Engines to regulate the speed. We have found it simple and reliable. Its distinctive features are: Perfect balance. Weight structure consists of a single cast arm, swinging about a common supporting pin and carrying an eccentric across shaft between a longer and shorter cut-off. Regulation and stability obtained by weighting arm at one or both ends and by adjustment of coil spring. Variation between no load and full load seldom exceeds 2%.

Continued on Next Page

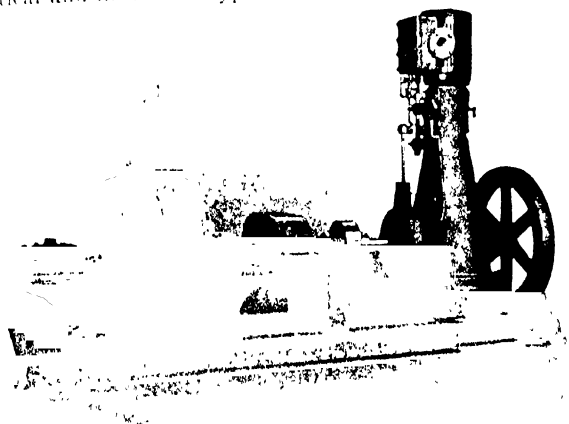
**TROY VERTICAL THROTTLING ENGINES**

For belted drive or direct connection. This engine makes a very desirable power unit for driving fans, blowers, pumps, etc., and occupies little space. For pump service a heavy balance wheel is supplied.

Balance slide valves are standard in all sizes. Special cylinders and special packing can be supplied for pressures exceeding 160 pounds or for superheat. Engines are self-oiling, or oil cup lubrication. Full equipment supplied. Also built duplex or in pairs to suit customers.

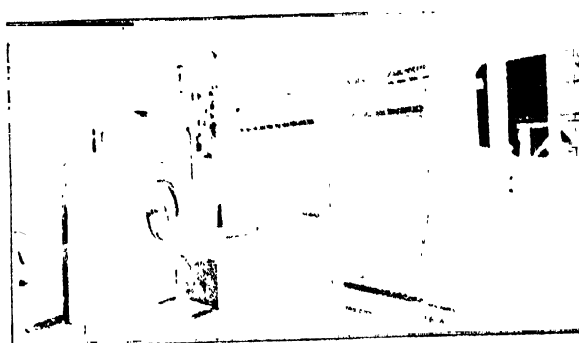
**LOW PRESSURE THROTTLING ENGINES**

Where it is necessary or desirable to obtain power from low steam pressures Troy Low Pressure Engines will give excellent service. They will use steam at from 10 to 35 pounds pressure, and the cylinders stand a safety test several times greater. Built in vertical and horizontal types.

**VERTICAL ENGINE DRIVING POSITIVE PRESSURE BLOWER****TROY VERTICAL THROTTLING ENGINES**

Specifications for Self Oiling or Cup Lubrication

Cylinder	Diameter	Stroke	Revolutions	Brake Horse-power ¾ Cut-off		Flywheel	Shaft	Pipes		Floor Space, Inches	Approx. Ship Weight
				50 Lbs. Steam Press.	1 Lb. Press. 1 Rev.	Diameter	Length	Supply	Exhaust		
						Face				Engine with Stand, Pairs	Engine with Stand, Pairs
High Pressure Type											
3 1/2	4	300	2 21	000082	16	13 1/2	21 1/2	1	1	20x24	500
4 1/2	5	300	4 81	000178	20	17 1/2	29 1/2	1 1/2	1 1/2	24x36	750
5 1/2	7	250	7 80	000346	26	21 1/2	36	1 1/2	1 1/2	31x36	1380
6 1/2	7	250	11 20	000499	26	21 1/2	36	1 1/2	1 1/2	31x36	1460
7 1/2	7	250	15 34	000682	26	21 1/2	36	1 1/2	1 1/2	31x36	1550
8 1/2	8	250	17 32	000770	26	21 1/2	36	1 1/2	1 1/2	31x36	1600
9 1/2	8	250	22 80	001014	36	21 1/2	36	2 1/2	2 1/2	36x48	2500
10 1/2	8	250	22 80	001014	40	21 1/2	36	2 1/2	2 1/2	36x48	2500
11 1/2	9	250	36 00	001600	44	10 1/2	4	3	4	44x56	4600
12 1/2	10	250	44 55	001980	44	10 1/2	4	3	4	44x56	4600
13 1/2	10	250	54 00	002400	44	10 1/2	4	3	4	44x56	4600
14 1/2	12	250	55 55	002880	54	12 1/2	5	4	5	54x68	6000
15 1/2	12	250	77 10	003427	54	12 1/2	5	4	5	54x68	7000
16 1/2	12	250	102 44	004064	54	12 1/2	5	4	5	54x68	7000
17 1/2	14	225	122 42	005441	60	14 1/2	7	6	6	60x68	13500
18 1/2	14	225	160 00	007108	60	14 1/2	7	6	6	60x68	13500
Low Pressure Type											
8	5	250	3 15	000063	20	4 1/2	15	1 1/2	2	23x20	950
10	7	250	6 50	000130	26	6 1/2	23	2	2 1/2	31x36	1800
12	7	250	9 50	000190	26	6 1/2	23	2 1/2	3	31x36	2000
14	7	250	13 50	000272	26	6 1/2	23	3	3 1/2	36x48	3000
16	8	250	11 40	000228	36	8 1/2	3	3 1/2	4	36x48	3200
18	8	250	17 65	01353	36	8 1/2	3	3 1/2	4	36x48	4000
20	9	250	12 85	00257	40	9 1/2	3 1/2	4	4	40x54	4900
22	9	250	28 90	00578	44	10 1/2	4	5	5	44x57	5000
24	10	250	22 30	00446	44	10 1/2	4	5	5	44x57	5000
26	12	250	30 45	00609	54	12 1/2	5	6	6	54x68	7000
28	12	250	38 50	00770	54	12 1/2	5	6	6	54x68	7000

**VERTICAL ENGINE DRIVING FAN****TROY HORIZONTAL THROTTLING ENGINES**

Sizes from 15 horse-power up, as per table below. Massive frame and base. Special bases can be supplied for direct-connected units. Self-oiling system or tank gravity lubrication. Left-hand engines standard. We build special equipment for driving blowers, fans, pumps, compressors, etc.

Like our Vertical Throttling Engines, these engines come also in a low pressure type, for use if it is necessary to utilize steam at from 10 to 35 pounds pressure.

**TROY HORIZONTAL THROTTLING ENGINES**

Specifications for Self Oiling or Tank Lubrication

Specifications for the Camp & Paine												
Cylinder	Brake Horse power ¾ Cut off				Flywheel	Shaft	Pipes		Floor Space, Inches	Approx. Ship Weight		
Diameter	Stroke	Revolutions	50 Lbs. Steam Press.	1 Lb. Press. 1 Rev.	Diameter	Face	Diameter	Length	Engine with Stand, Pairs	Engine with Stand, Pairs		
High Pressure Type												
3 1/2	4	250	17 32	000770	26	8 1/2	3	4 1/2	2	2	43x72	3300
4 1/2	5	250	22 80	001014	36	8 1/2	3	4 1/2	2	2	43x72	3300
5 1/2	7	250	32 40	001440	40	9 1/2	3 1/2	5 1/2	2 1/2	3	53x82	4700
6 1/2	7	250	36 00	001600	44	10 1/2	4	5 7/8	3	4	57x80	5000
7 1/2	7	250	44 55	001980	44	10 1/2	4	5 7/8	3	4	57x80	5000
8 1/2	8	250	54 00	002400	44	10 1/2	4	5 7/8	3	4	57x80	5800
9 1/2	8	250	55 55	002880	54	12 1/2	5	6 1/8	3 1/2	5	65x105	7800
10 1/2	10	250	77 10	003427	54	12 1/2	5	6 1/8	3 1/2	5	65x105	8000
11 1/2	12	250	102 44	004064	54	12 1/2	5	6 1/8	3 1/2	5	65x105	8200
12 1/2	12	250	122 42	005441	60	14 1/2	7	6 3/4	4	6	66x121	15000
13 1/2	14	225	160 00	007108	60	14 1/2	7	6 3/4	4	6	66x121	15000
Low Pressure Type												
12	8	250	11 40	00228	36	8 1/2	3	4 1/2	1	3 1/2	45x73	3800
14	8	250	17 65	00153	36	8 1/2	3	4 1/2	1	3 1/2	45x73	4000
16	9	250	12 85	00257	40	9 1/2	3 1/2	5 1/2	1	4	54x82	5000
18	9	250	28 90	00578	44	10 1/2	3 1/2	5 1/2	4 1/2	6	56x82	5200
20	10	250	22 30	00446	44	10 1/2	4	5 7/8	3 1/2	6	57x80	6200
22	12	250	30 45	00609	54	12 1/2	5	6 1/8	4	7	65x106	8000
24	12	250	38 50	00770	54	12 1/2	5	6 1/8	4	7	65x106	8800

**GUARANTEE**

Each engine is guaranteed to perform its service, careful usage being imposed, including clear oil and steam passages, good lubrication and intelligent adjustment. Any parts proving defective (subject to manufacturers' inspection) within one year from date of shipment will be replaced by us.

The success which has attended our engines during the twenty-eight years we have been specializing in small engines warrants us in promising durable, simple equipment which will not require frequent repairing or replacement—qualities which recommend our engines for industrial chemical plants.

# TURNER, HALSEY CO.

62 Leonard Street  
NEW YORK, N. Y.

BRANCHES  
Baltimore Boston Philadelphia Chicago St. Louis New Orleans San Francisco

SOLE AGENT FOR  
MT. VERNON-WOODBERRY MILLS, INC.

## PRODUCTS

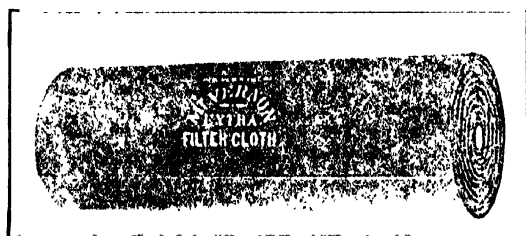
Filter Cloths

Paper Mill Dryer Felts

Cotton Duck

## VARIETY

From an extremely fine, closely woven fabric for fine filtering processes, Mt. Vernon-Woodberry brands range to the coarse, less closely woven cloths suited to refining that is not of a high grade. Any Filter Cloth, if the proper width is not in stock, will be made up in whatever width the customer requires for his particu-



STANDARD ROLL OF FILTER CLOTH

lar press, or, if no one of the standard fabrics meets perfectly his special requirements, the mills will be not only willing but anxious to experiment with new and additional constructions that will insure absolutely satisfactory results. Packed in rolls of about 100 yards.

## DELIVERIES

Deliveries, even of special orders, can be made promptly because of the great production facilities of the Mt. Vernon-Woodberry Mills. Samples and further information on request.

## APPLICATIONS

Any industry whose processes require the use of Filter Cloth can select from among the Mt. Vernon-Woodberry brands precisely the grade and character of cloth which fulfils its requirements most exactly. These Filter Cloths are now employed in the processes for:

Alkali  
Beet Sugar  
Borax  
Cane Sugar  
Chemicals  
Cider  
Clay  
Dyestuffs  
Fruit Juices  
Guncotton  
Metallurgical Products  
Oils  
Paint and Pigments  
Paraffine Wax  
Starch  
Varnish  
Whiting  
Etc.



# THE TWITCHELL PROCESS COMPANY

CINCINNATI, OHIO

## PRODUCTS

**Kontakt Saponifiers** for use in the Twitchell Process for splitting Fats and Oils.

**Kontakt Saponifier** for High Grade Fats.

**Kontakt D. P. Saponifier** for Fats which are subsequently to be distilled. This Reagent is supplied in two forms, Acid and Neutral. The Acid form is supplied only in barrels, and is ready for use. The Neutral form is supplied on a bulk basis, and may be shipped in tank cars. It is necessary to acidulate this form before it is ready for use.

## THE TWITCHELL PROCESS

**Description.** The Process consists in boiling Fats and Oils (Glycerides) with water to which has been added a small quantity of the splitting Reagent, or Saponifier, and a small quantity of Sulphuric Acid.

The Saponifier decomposes the Fat from which the Glycerine separates and dissolves in the water, which, when boiling is discontinued, quickly settles to the bottom of the tub. After neutralizing the Glycerine solution can be evaporated down to crude glycerine, and the highest quality of dynamite and C. P. Glycerine can be made from it.

Fatty Acids from which the Glycerines have been separated may be manufactured into soap by direct combination in the soap kettle, or mixer, or may be worked up by panning and pressing into Stearic Acid and Red Oil.

**Equipment**—All the apparatus necessary for carrying out the Process are lead- or copper-lined tubs, for acid-boiling the Fats before splitting, and wooden tubs in which the decomposition is carried out. The tubs must be of sufficient size to handle the desired quantity of Fatty Acid. The expense of installation is small, as compared with splitting with any other means, and it is the only process by which bulk quantities can be handled. This brings about considerable saving in the labor and steam required.

**Advantages**—The important advantages of the Twitchell Process over other processes for Glycerine recovery are:

(1) A higher percentage of yield of Glycerine of

better quality is obtained at a lower cost per unit.

- (2) Absolute safety to workmen and property prevails throughout the entire operation, no high steam pressures are employed.
- (3) By employing Fatty Acids for soap-making, a saving of time, labor, steam and alkali is effected, together with saving of chemicals used for treating spent soap lyes, as compared with direct alkali saponification of the original fats.
- (4) Very large quantities of fats may be decomposed in a single operation with low operating costs.
- (5) The plant employed is extremely simple and inexpensive in character and its operation may be quickly learned by any workman of ordinary intelligence.
- (6) The quality of Stearic Acid obtainable by properly pressing the Fatty Acids produced by the Twitchell Process is unexcelled.

**Application**—Large quantities of low grade Fats are annually reclaimed for purposes of soap and candle making, by distillation. Before this operation can be successfully carried out, it is necessary that the Glycerine be separated from these Fats in order to avoid formation of excessive amounts of hydrocarbons and of pitch when the Fats are heated to the high temperature required to distil them. Crude Fatty Acids, obtained from low grade materials by means of the Twitchell Process and the Kontakt D. P. Saponifier, contain less Glycerine and consequently work more freely through the still; the distillate comprises a higher percentage of clean Fatty Acids, and lower yields of Pitch are obtained than is the case with crude Fatty Acids which have been prepared from similar materials by autoclaves.

## INFORMATION

Through our Chemical Service Department we shall be glad to provide further information concerning the practical application of the Twitchell Process with Kontakt Saponifiers, and possibilities in connection with the use of Fatty Acids for the manufacture of Soap and Stearic Acid and Red Oil.



# UEHLING INSTRUMENT COMPANY

2107 EMPIRE BLDG., NEW YORK, N. Y.

Boston

Chicago

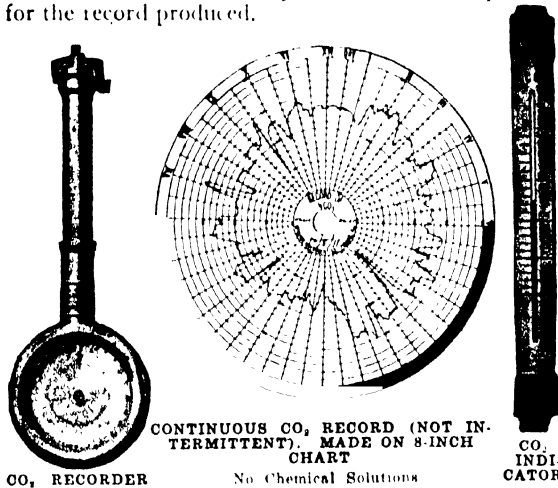
Cable Address  
"UEHLINGCO," New York

## PRODUCTS

**Fuel Economy Apparatus, Instruments for Measuring and Recording CO<sub>2</sub>, Temperature, Draft, Differential Draft, Pressure, Differential Pressure, Absolute Pressure, Barometric Pressure, etc.**

### UEHLING CO<sub>2</sub> RECORDING EQUIPMENT

This equipment consists of the instrument proper which can be located in any convenient part of the plant, the CO<sub>2</sub> recording gauge which can be located in the office of the chief engineer or superintendent, and the auxiliary CO<sub>2</sub> indicator which can be located at the furnace front for the guidance of the fireman or attendant, who thereby can be held responsible for the record produced.



The subject of combustion efficiency is undoubtedly one of the most important before the engineer, and it is through the above equipment that we are able to provide a means for keeping continuous tabs on the fuel wasted up the chimney.

Uehling CO<sub>2</sub> Recording Equipment eliminates the use of springs, multiplying levers, rubber hose connections, automatic cocks, glassware and corrosive liquids, all of which elements are a source of trouble. Send for our Bulletin 111, also Booklet entitled "Combustion and the Cost of Power."

### UEHLING COMBINED BAROMETER AND VACUUM RECORDER

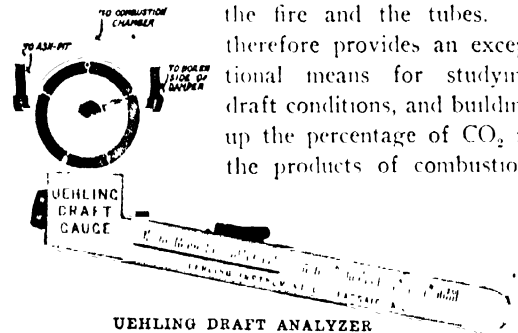
This instrument will put a record of both the vacuum and barometric pressures on the same chart, and is therefore of particular value when applied to con-



densing plants or the measurement of any other vacuum, where it is of importance to compensate for any change in barometric pressure. In this recorder the difference between the two records always represents the absolute pressure.

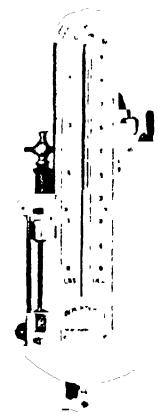
### UEHLING DRAFT ANALYZER

This instrument when connected as shown will measure the resistance through the fire bed, the resistance through the tubes and the combined resistance through the fire and the tubes. It therefore provides an exceptional means for studying draft conditions, and building up the percentage of CO<sub>2</sub> in the products of combustion.



### UEHLING ABSOLUTE PRESSURE INDICATOR

This instrument will measure absolute pressure in pounds per square inch and inches of mercury head and is entirely independent of any change in barometric pressure. It is therefore most reliable and accurate in vacuum determinations.



### UEHLING RECORDING INSTRUMENTS



All Uehling Recording Instruments are based on the hydrostatic principle as indicated by the sectional cut. It is this principle which in itself guarantees absolute accuracy and makes it possible to eliminate the use of springs, levers and joint movements which are invariably a source of change in calibration due to variable friction and molecular construction of the material used.

We are also prepared to build instruments for special purposes.

# THE TWITCHELL PROCESS COMPANY

CINCINNATI, OHIO

## PRODUCTS

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**Application**—Large quantities of low grade Fats are annually reclaimed for purposes of soap and candle making, by distillation. Before this operation can be successfully carried out, it is necessary that the Glycerine be separated from these Fats in order to avoid formation of excessive amounts of hydrocarbons and of pitch when the Fats are heated to the high temperature required to distil them. Crude Fatty Acids, obtained from low grade materials by means of the Twitchell Process and the Kontakt D. P. Saponifier, contain less Glycerine and consequently work more freely through the still; the distillate comprises a higher percentage of clean Fatty Acids, and lower yields of Pitch are obtained than is the case with crude Fatty Acids which have been prepared from similar materials by autoclaves.

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# UNION STEAM PUMP COMPANY

Pumping Machinery, Compressors, Condensers  
 FACTORY AND MAIN OFFICES, BATTLE CREEK, MICH., U. S. A.  
 SALES AND SERVICE REPRESENTATIVES IN ALL THE PRINCIPAL CITIES

## PRODUCTS

Union Simplex and Duplex Steam and Power Pumps.

Centrifugal Pumps.

Condensers.

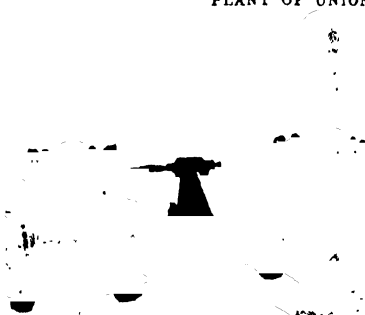
Air Compressors.



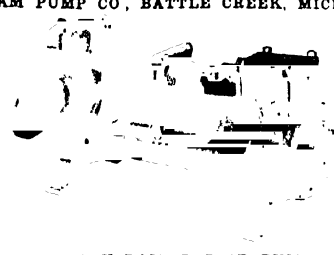
PLANT OF UNION STEAM PUMP CO., BATTLE CREEK, MICH.



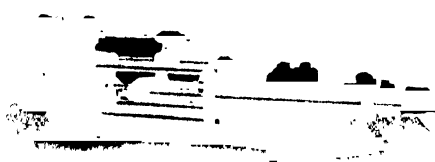
DUPLEX POWER PUMP



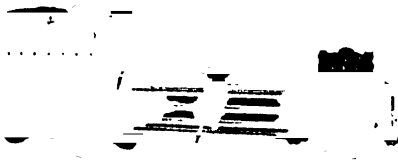
SIMPLEX BOILER FEED PUMP



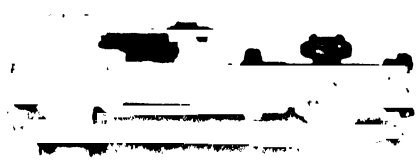
DUPLEX BOILER FEED PUMP



HYDRAULIC PRESSURE PUMP



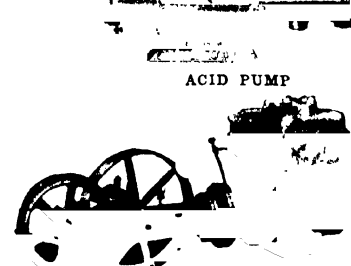
WET VACUUM PUMP



MAGMA PUMP



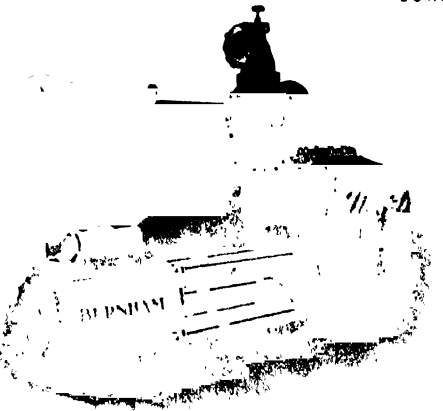
SURFACE CONDENSER



ACID PUMP



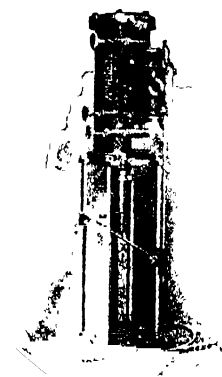
FILTER PRESS PUMP



JET CONDENSER

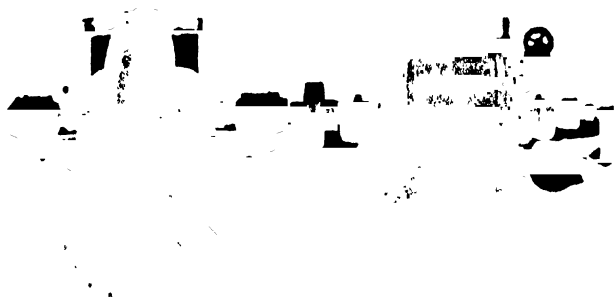


CONDENSATION PUMP



DEEP WELL PUMP

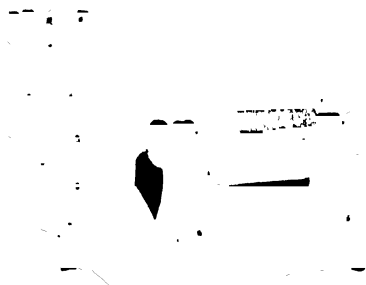
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SINGLE STAGE DOUBLE SUCTION CENTRIFUGAL PUMP



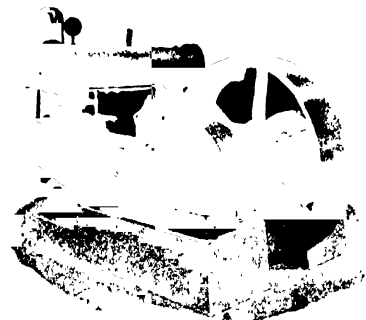
MULTISTAGE CENTRIFUGAL PUMP



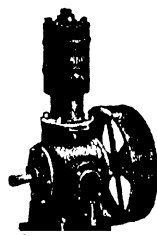
SINGLE SUCTION CENTRIFUGAL PUMP



DUPLEX CROSS COMPOUND TWO STAGE AIR COMPRESSOR



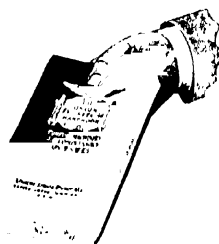
DUPLEX TWO STAGE BELTED AIR COMPRESSOR



SINGLE VERTICAL AIR COMPRESSOR



DUPLEX VERTICAL AIR COMPRESSOR



UNION ENGINEERING HAND BOOK

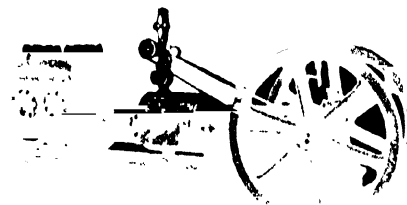
The only hand book published devoted exclusively to engineering data and tables for calculating air compressors, centrifugal pumps, condensers and steam and power pumps. Send for copy.



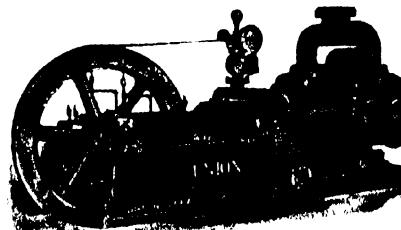
STEAM DRIVEN DRY VACUUM PUMP



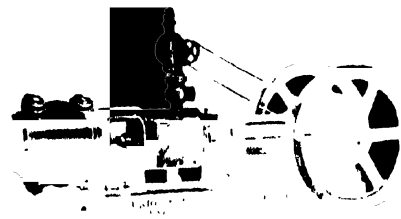
DUPLEX STEAM DRIVEN DRY VACUUM PUMP



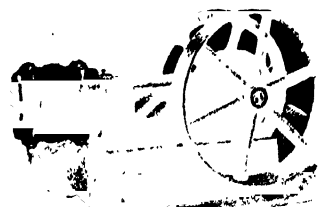
CRANK AND FLYWHEEL WET VACUUM PUMP



DUPLEX CRANK AND FLYWHEEL WET VACUUM PUMP



STEAM DRIVEN AIR COMPRESSOR



BELT DRIVEN AIR COMPRESSOR

# UNITED FILTERS CORPORATION

Manufacturers of

Industrial Filters and Metallic Filter Cloth  
MAIN OFFICE AND WORKS, HAZLETON, PA.

New York Chicago Salt Lake City San Francisco Los Angeles  
Cable Address: "FILTREX", New York Codes: BENTLEY'S WESTERN UNION 5 Letter

## PRODUCTS

Pressure Leaf Type Filters, Continuous Vacuum Type Filters, Filter Presses (Recessed and plate and frame types), Filters of special metal construction, Laboratory Filters, Metallic Filter Cloth and Cotton Filter Cloth.

Also Pumps, etc.

## INDUSTRIAL USES OF UNITED FILTERS EQUIPMENT

United Filters Equipment is in use in practically every industry having filtration work in the United States. This equipment is used principally in the following industries:

Beet Sugar	Industrial waste water
Cane Sugar (factories and refineries)	Pulp and Paper
Chemicals	Soap
Pigments and colors	Glycerine
Dyes/stuffs	Coal tar Chemicals
Soft drinks	Starch
Beer	Food products, miscellaneous
Flavoring extracts	Glucose
Mining (cyanide and flotation concentrates)	Potash
Oils (animal, vegetable and mineral)	Metallurgical preparations
	Pharmaceutical preparations
	Cement
	Insecticides

## SWEETLAND'S PATENT METALLIC FILTER CLOTH

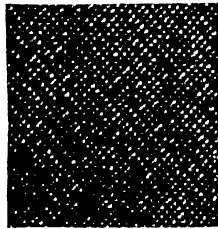


FIG. 1—SWEETLAND'S PATENT METALLIC FILTER CLOTH

This patented fabric is made up regularly in monel metal, which is alkali proof, resistant to most dilute acids, fireproof, many times as strong as ordinary filter fabrics, easy to handle and easy to clean. It will filter chemicals that would cause most fabrics to disintegrate rapidly, and will last many times as long as the ordinary run of filter cloths. A sample will be sent on request to enable prospective purchasers to prove this statement. Its strength, ruggedness and flexibility can be tested by bending back and forth—no spreading of the wires will occur.

Employed as a filter medium in chemical, sugar and oil industries; used in many Sweetland Filters, continuous filters, plate and frame filters, as well as for tank bottoms, centrifugals, etc.

Carried regularly in stock in monel metal in 24, 30, and 36-in. widths. Made to order in special widths in monel, phosphor bronze, brass, etc.

## THE AMERICAN CONTINUOUS FILTER

In these machines filtration is carried on by means of a vacuum which induces a flow of filtrate to the discharge. The filter elements are heavy screen or corrugated wood discs divided into sectors. They are mounted perpendicular to a horizontal shaft provided with longitudinal passageways which connect to all leaf sectors in the same phase of rotation.

The lower half of the filter leaves dip into the sludge

or pulp which is held in a semicircular pan, one side of which is cut away between each filter leaf to provide space for the cake discharge. The vacuum, maintained on the interior of the discs through connections inside the shaft, draws the filtrate through the cloth. Solid matter cakes to the discs and dries during part of a revolution. It is then detached by scrapers, aided by compressed air which inflates each section as it nears the scraper. The cake drops through the space which is left between each disc by the cutting away of the pulp pan and is caught in a suitable conveyor. When the solids are to be washed, a spray washing mechanism is provided.



FIG. 2—AMERICAN CONTINUOUS FILTER

The operation is continuous, each leaf sector passing in turn through a period of filtering, washing, drying and discharging. Speed of rotation varies, according to the material being handled, from one revolution every fifteen minutes to one every minute.

**Advantages of American Continuous Filter**—This design permits the installation of a much greater filter area in the same floor space than is possible with other types of suction filters. Huge diameters are unnecessary and the filter requires little head room. Filter cloth is thoroughly cleaned at each revolution, thus a maximum capacity per unit of filter area is maintained. Ample drainage is provided from the filter leaves, insuring a dry cake. Any single leaf sector can be removed and recovered, thus eliminating long shut-downs for redressing. The sectionalized design facilitates transportation and erection of this equipment in remote parts of the country. The filter weighs less per unit of filter area than any other type of vacuum filter.

### SIZES OF AMERICAN CONTINUOUS FILTERS

Type	Approx. Filter Area	Diam. of Discs	No. of Discs	No. of Sectors per Disc	Disc Spacing	Approx. Floor Space		Head Room	Shipping Weight
						Width	Length		
4-1	22	4'	1	8	11"	5'9" x 3'6"		5'	900
4-6	130	4'	6	8	11"	5'9" x 8'7"		5'	3900
6-2	90	6'	2	10	14"	8'6" x 5'6"		8'	6200
6-12	540	6'	12	10	14"	8'6" x 10'2"		8'	15700
8-2	180	8'6"	2	10	18"	7'11" x 9'8"		9'8"	10000
8-6	540	8'6"	6	10	18"	13'11" x 9'8"		9'8"	15100

Table shows only extreme sizes. Intermediate sizes are also made. We are prepared to supply larger units with discs as great as 14 ft. in diameter.

\* 14" spacing is employed when solids are to be washed.

## KELLY AND SWEETLAND PRESSURE FILTERS, LEAF TYPE

These filters are so designed that the solids are not deposited in a chamber but are built up in an even layer upon the outside surfaces of a plurality of filter leaves mounted within a pressure shell and so spaced that adjacent cakes of solids do not touch each other.

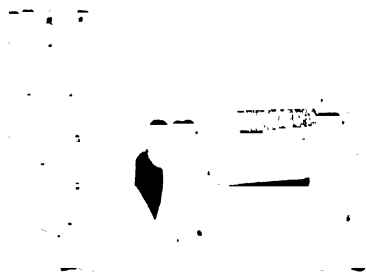
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SINGLE STAGE DOUBLE SUCTION CENTRIFUGAL PUMP



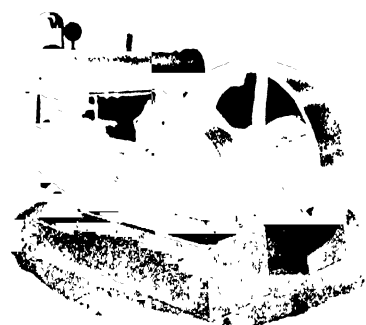
MULTISTAGE CENTRIFUGAL PUMP



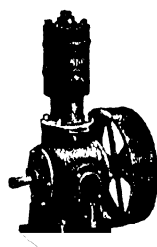
SINGLE SUCTION CENTRIFUGAL PUMP



DUPLEX CROSS COMPOUND TWO STAGE AIR COMPRESSOR



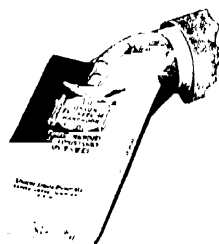
DUPLEX TWO STAGE BELTED AIR COMPRESSOR



SINGLE VERTICAL AIR COMPRESSOR



DUPLEX VERTICAL AIR COMPRESSOR



UNION  
ENGINEERING  
HAND BOOK

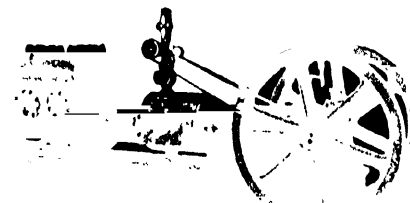
The only hand book published devoted exclusively to engineering data and tables for calculating air compressors, centrifugal pumps, condensers and steam and power pumps. Send for copy.



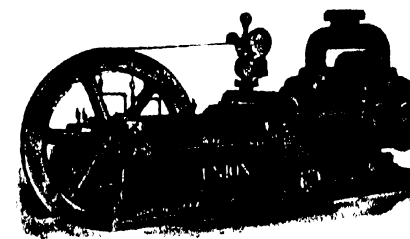
STEAM DRIVEN DRY VACUUM PUMP



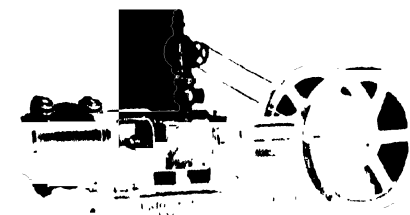
DUPLEX STEAM DRIVEN DRY VACUUM PUMP



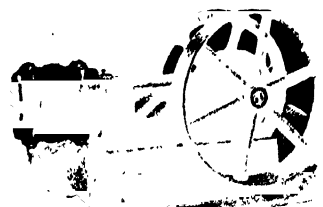
CRANK AND FLYWHEEL WET VACUUM PUMP



DUPLEX CRANK AND FLYWHEEL WET VACUUM PUMP



STEAM DRIVEN AIR COMPRESSOR



BELT DRIVEN AIR COMPRESSOR



# UNION WATER METER COMPANY

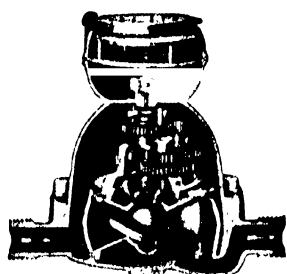
Incorporated 1865



MAIN OFFICE AND FACTORY  
WORCESTER, MASS.

## PRODUCTS

Meters, Cold Water, Hot Water, Oil, Gasoline, other fluids; Union Fitts Chronometer Valves; Union Press for lining Service Pipe with cement; Union Pressure Regulators, no springs; Worcester Steam Fire Signals.



KING MODEL B DISC METER

### KING MODEL B DISC METERS

These meters are of the positive measuring self draining type unsurpassed for strength, simplicity, durability and accuracy under varying conditions.

### COLD WATER METERS

Outer casings and interior framework bronze  
Disc hard rubber, 3 part type reinforced with steel.  
Intermediate gears hard rubber or bronze  
Pinions and screws genuine monel metal to naval specification

Register round or straight, reading type indicating cubic feet, gallons, liters or unit desired.

Catalog C No. 49.

### KING MODEL B METERS FOR HOT WATER

With Union "Cohot" Disc, not metal for accuracy and service.

Intermediate Gears bronze

Other materials and construction like and interchangeable with cold water meters.

Catalog C No. 49.

### CORPORATION, CURB AND WASTE STOPS



CURB STOP

U. W. M. Co. Corporations, Curb and Waste Stops are made from new metals and have solid plugs except for the necessary water way. Each stop is tested under 250 lbs. water pressure before shipment and is guaranteed for five years against leakage other than from frost or heat.

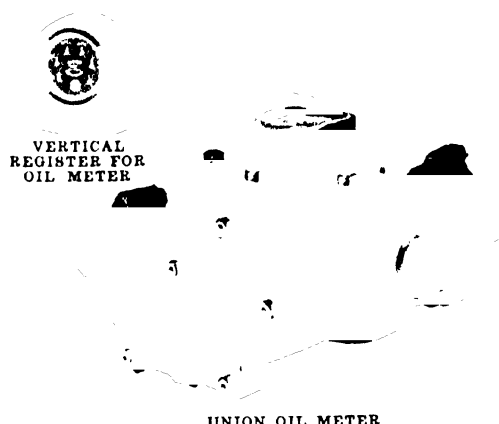
### FIRE AND FACTORY SIGNALS

Worcester Fire and Factory Signals, tone distinctive and far reaching - no confusion with other signals in time of need

Catalog C No. 51.



FIRE AND FACTORY SIGNAL



UNION OIL METER

### THE UNION OIL METER

For the measurement of oils of different specific gravities under a wide range of conditions and pressures, is of the slow moving, double acting reciprocating piston type, and has given universal satisfaction for many years. This meter has but one valve, conical in form with ports so arranged that opposite ends of the measuring cylinders are filled in such constant succession that uninterrupted flow of liquid is maintained.

The angle of valve to its seat and the rotary motion when operating insures even wear and longer continued accuracy than other types of valves.

Accurate registration and positive action are secured by a simple gear train, no springs or ratchets being used.

The meter may be calibrated for varying service conditions and fine adjustments of registration may be made by change of one gear in the register.

### UNION FITTS CHRONOMETER VALVES

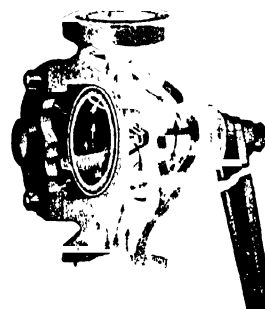
Union Fitts Chronometer Valves are designed for regulating and governing purposes only and should not be used as stop valves.

They are of the rotating valve type, having a conical valve ground to a joint with the seat and ports so arranged that a rotation through an arc of 45 degrees, one-eighth turn, completely opens or closes the valve.

Quickness and ease of operation and sensitive adjustment to varying conditions make these valves especially desirable to control the supply of steam water, gas, oil and air to engines, stokers, tanks, blowers, etc.

Made in standard sizes ranging from  $\frac{3}{8}$ " to 8".

Catalogue C No. 50.



CHRONOMETER VALVES



# UNITED LEAD COMPANY

Acid-Proof Lined Pipe, Valves and Special Apparatus

111 BROADWAY, NEW YORK, N. Y.

## PRODUCTS

### Chemical Lead-Lined

Pipe	Soil Pipe
Tubes	Valves
Fittings	Pipe Bends
Coils	Acid Drums
Tanks	Mixing Kettles
Evaporators	Still
Condensers	Autoclaves

### Special Apparatus

### Chemical Lead-Covered

Pipe	Agitators
Tubes	Steel Sheets
Copper Sheets	Steel Bars
Heating and Cooling Coils	

### Chemical Lead-Coated

Pipe	Sheets
Tubes	Bars

### Hard Lead

Acid Pumps	Special Bends
Plug Bibbs	Plug Cocks
Valves	Fittings

### Flanged Connections

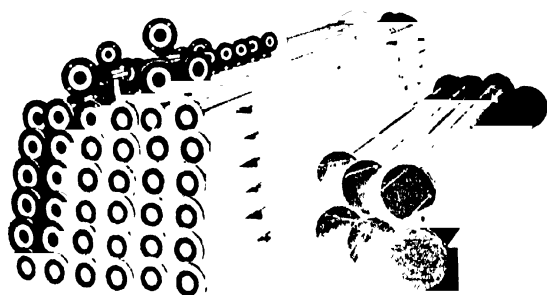
### Block Tin

We can furnish any of the foregoing list of products lined, covered or coated with pure Block Tin.

### Brass and Copper Lined Pipe

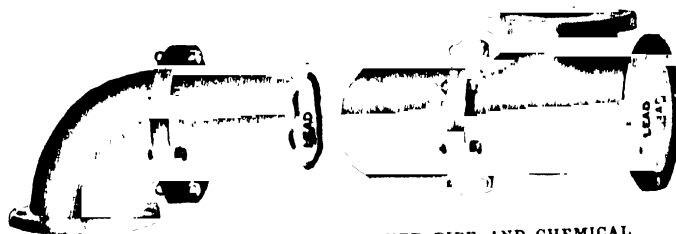
## • "UNITED" CHEMICAL LEAD-TUBE LINED IRON PIPE

Chemical Lead-tube lined iron pipe, when rightly made, has long been recognized as the ideal combination where strength, acid-resisting and non-corrosive qualities are required.



"UNITED" CHEMICAL LEAD-TUBE LINED FLANGED PIPE

It is particularly serviceable in connection with acids, chemicals, acidiferous mine water, salt water, or any corrosive agents that will affect plain or galvanized iron or steel pipe.



"UNITED" CHEMICAL LEAD-TUBE LINED PIPE AND CHEMICAL LEAD LINED FITTINGS

By our special process of manufacture we produce a perfect chemical tube lined pipe with a lining inseparably bonded to the outer tube of iron or steel, affording a smooth interior surface with friction reduced to the minimum and free from porous or defective spots.

## "UNITED" FLANGED CHEMICAL TUBE LEAD-LINED IRON PIPE

The acid-proof chemical tube lead lining is protected by the outer iron pipe from pressure, the bond preventing sagging or collapse. The chemical lead lining on flanged pipe is turned over the face of the recessed flange in a most thorough manner, making a perfectly tight lead-to-lead joint at each flange, thus eliminating any danger of leakage.

The distinctive features of this pipe are its strength, acid-resisting and non-corrosive qualities.

Furnished in accordance with engineers' specifications or designs.

"United" flanged chemical lead-tube lined pipe and chemical lead-lined fittings are recommended as of the highest quality, and are used in the largest chemical plants in the world.

## "UNITED" CHEMICAL LEAD-LINED FITTINGS

**Flanged**—All types and sizes of chemical lead-lined flanged fittings can be furnished in any standard dimensions. Regular standard flanges faced and drilled according to the A. S. M. E. standard unless otherwise specified.

**Screwed**—These fittings are lined by our special process, and are made with a grooved or recessed shoulder joint by which the end of the pipe when made up into the fitting is completely surrounded by the lead, thus preventing corrosion at this point as well as insuring tight joints.

*Continued on Next Page*

**"UNITED" TIN-LINED PIPE AND FITTINGS**

The lining in United Tin-Lined Pipe and Fittings is made of best grade tin and inseparably bonded to the iron or steel casing. They are particularly adapted for use in Canning Factories, Food Product Plants, etc., for the conveying of milk, fruit juices, vinegar, and citric acid products. It is also used with great advantage in the conveying of pure water, both spring and distilled.

Many very large plants in the manufacture of these various products are using United Tin-Lined Pipe and fittings.

"United" Tin Covered Pipe and Fittings can also be furnished.

**"UNITED" BRASS OR COPPER-LINED IRON PIPE**

Particularly adapted for use as range and boiler connections, as well as supply and waste pipes.

The brass or copper tubing is **inseparably united** to the outer tube of iron by the "United" process.

Made with galvanized finish, unless otherwise ordered.

"United" special finish brass fittings are recommended and furnished for use with this pipe.

**"UNITED" CHEMICAL LEAD-LINED SOIL PIPE AND FITTINGS**

"United" Chemical Lead-Lined Soil Pipe and Fittings are primarily for waste lines where the waste liquor is likely to be acidulous, such as in storage battery plants, laboratories, experimental stations, etc.

There is an increasing demand for this class of pipe among the chemical companies for lines that are to be laid beneath the ground, the outside cast iron shell not being affected by moisture or earth secretions.

"United" Chemical Lead-Lined Soil Pipe and Fittings for this class of work properly installed should last indefinitely. All pipe and fittings furnished by us are of the grade known as "extra-heavy" and the lead lining is of the best grade chemical Lead.



**"UNITED" CHEMICAL LEAD-LINED SOIL PIPE AND FITTING**

**"UNITED" CHEMICAL LEAD-LINED DRAIN-AGE FITTINGS**

For drainage lines we furnish "United" chemical lead-lined Genuine Durham Recessed Fittings. "United" Chemical lead-lined iron pipe and chemical lead-lined Durham Fittings make the most practical drainage lines.

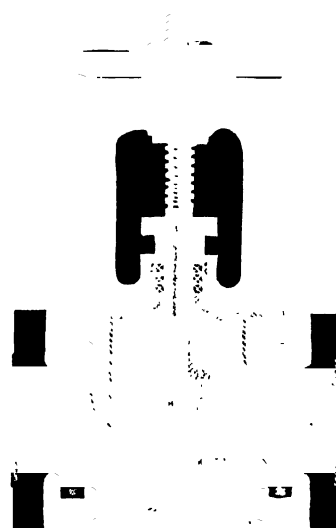
**"UNITED" ACID VALVES**

"United" Acid Valves are heavily lined throughout with a special acid resisting alloy. Seats are made of a composition which, being harder than lead, is better adapted to withstand the cutting or wear likely to occur at this point.

Constructed of iron and brass, except the interior. They are the strongest acid valves on the market and are not liable to be broken in transportation, during installation, or in actual use, as is the case with valves made wholly of lead composition metal, which is brittle and easily broken, particularly at the flanges. "United" Acid Valve Flanges are made extra strong and will last indefinitely. They have a specially constructed stuffing box packed with an acid-proof packing made to our own formula.

Made in all required sizes and styles: Y, angle, globe, gate, and diaphragm patterns. Particular attention is called to our Taper Plug and Seat Valves as shown in Globe, Y and Angle Pattern. "United" valves are especially adapted for use where there is a possibility of the accumulation of acid settlements or sludge.

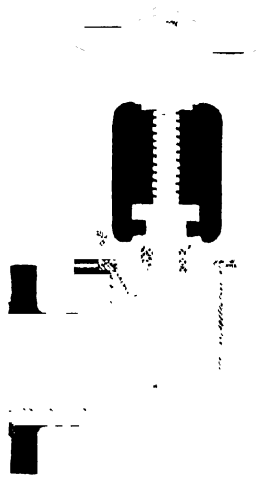
**"United" Plug and Seat Type Valves**—"United" Valves are stronger and will stand greater pressure than cast iron, cast hard lead or any other type of acid valves. Always tight when closed and by seating at top when opened pressure is taken from the stuffing box insuring a very long life. "United" valves are easily accessible and admit of efficient and rapid repairs, which is very essential where spare valves are not stocked.



**"UNITED" GLOBE PATTERN PLUG AND SEAT TYPE VALVE**

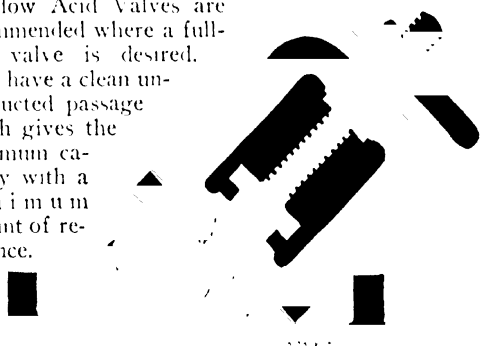
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"United" Valves where required can be furnished with acid-proof rubber discs, which are especially adapted for the handling of gritty liquors. These discs are removable and can be replaced at a nominal cost.



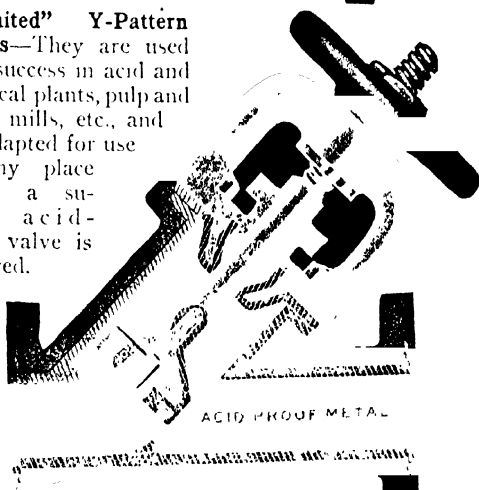
ANGLE PATTERN—PLUG AND SEAT TYPE

"United" Y" Pattern or Freeflow Acid Valves are recommended where a full-way valve is desired. They have a clean unobstructed passage which gives the maximum capacity with a minimum amount of resistance.



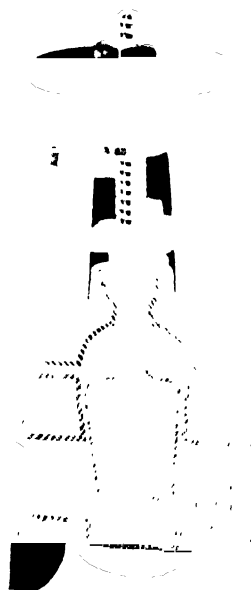
Y-PATTERN—PLUG AND SEAT TYPE

"United" Y-Pattern Valves—They are used with success in acid and chemical plants, pulp and paper mills, etc., and are adapted for use in any place where a superior acid-proof valve is required.



Y-PATTERN—DISC TYPE

We confidently recommend United Acid Valves with the assurance that they will meet in every way the severe tests and conditions encountered where liquids of a searching or corrosive nature are handled.



GATE PATTERN

"United" Block Tin Lined Valves—"United" Acid Valves can also be furnished with a heavy lining of pure block tin for the handling of Acetic and Citric Acids, Acid Gases, Food Products, Fruit Juices and distilled or hot water.

Special Acid Valves made and lined in accordance with engineer's specifications or designs.

#### "UNITED" HARD LEAD PLUG COCKS AND BIBBS

Adapted for contact with acid where they are opened or used infrequently. Where the stress caused by operation is sufficiently severe, the installation of "United" acid-proof valves is recommended.

In addition to flanged types illustrated we manufacture Straight Plug Cocks and Plain Plug Bibbs, also special Flanged Hard Lead Taper Shank Cocks with bronze couplings, lead faced.



FLANGED PLUG BIBB



FLANGED PLUG COCK

*Continued on Next Page*

### "UNITED" HARD LEAD SINGLE STAGE CENTRIFUGAL ACID PUMPS

We have combined in "United" Hard Lead Acid Pumps all the essential details to make a high-class acid pump.



"UNITED" HARD LEAD SINGLE STAGE ACID PUMP  
Furnished for Direct or Belt Drive

#### SIZES AND CAPACITIES OF "UNITED" SINGLE STAGE PUMPS

No.	Suction	Discharge	Normal Capacity gallons per minute
1	1 1/2 in.	1 1/2	30
1 1/2	2 in.	2	75
2	3 in.	3	130
3	4 in.	4	300
4	5 in.	5	500

Data for larger capacities furnished on application

"United" Centrifugal Acid Pumps are designed for, instead of adapted to, the use of the Chemical Industry. They are made for heavy duty and hard service and have proved a most economical and satisfactory installation for loading Acid Barges, and Tank Cars, for Acid Circulating Systems and all General Acid Pumping problems.

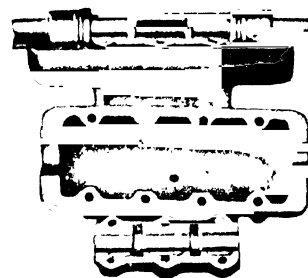
"United" Acid Pumps after careful consideration by competent Engineers were selected for use in places where efficiency was required and repairs were almost impossible.

**Casing** The casing is made of a special acid resisting hard lead alloy of sufficient thickness to easily withstand the maximum pressure. The inside of the casing is machine finished with impeller fitted accurately, giving a closer running fit.

**Shaft and Impeller**—The shaft and impeller are made of a special acid resisting alloy and of ample size to transmit the maximum power. The design of the impeller insures the highest possible efficiency.

**Stuffing Box**—The stuffing box is packed with a special acid resisting packing. It is lubricated by large internal grease glands supplied by acid-proof compression grease cup.

**Bearings**—Pedestal bearings are generously proportioned and of the self oiling type, with large oil reservoirs all properly housed.



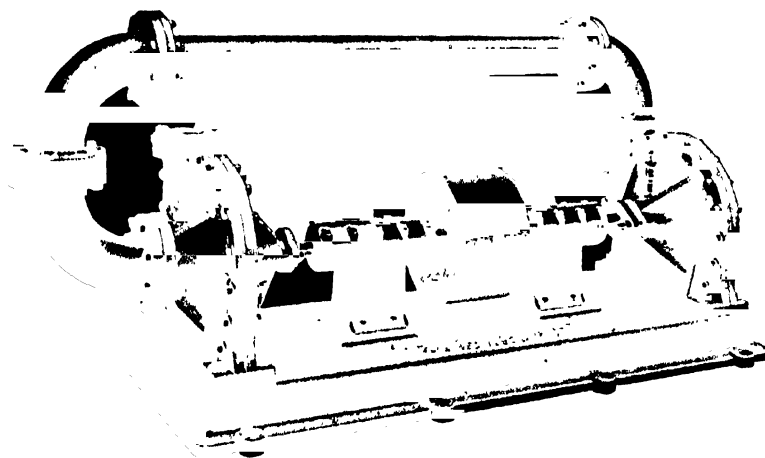
"UNITED" PUMP BEARING

These bearings support the shaft, with the front bearing equipped with self-aligning ball bearing thrusts which keep the impeller properly centered in the shell.

"United" Hard Lead Pumps are mounted on a heavy cast iron support, resulting in perfect alignment.

### "UNITED" TWIN HARD LEAD ACID PUMPS

For installations where the head is greater than can be efficiently handled by a single stage pump.



"UNITED" TWIN HARD LEAD ACID PUMP  
Furnished for direct or belt drive

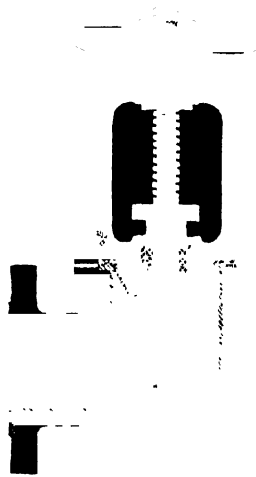
### "UNITED" TIN-LINED HARD LEAD CENTRIFUGAL ACID PUMPS

For the handling of Food Products, Vinegar, Acetic Acid, Distilled Water, we manufacture Block Tin Lined Centrifugal Acid Pumps.

They embody all the features of the "United" Hard Lead Acid Pumps and are lined with a heavy lining of the best grade of Pure Block Tin by the "United" Process, which insures a perfect Block Tin contact throughout.

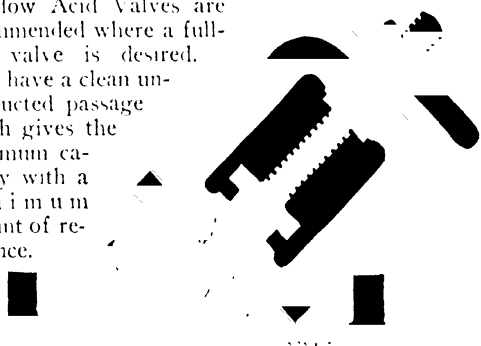
*Continued on Next Page*

"United" Valves where required can be furnished with acid-proof rubber discs, which are especially adapted for the handling of gritty liquors. These discs are removable and can be replaced at a nominal cost.



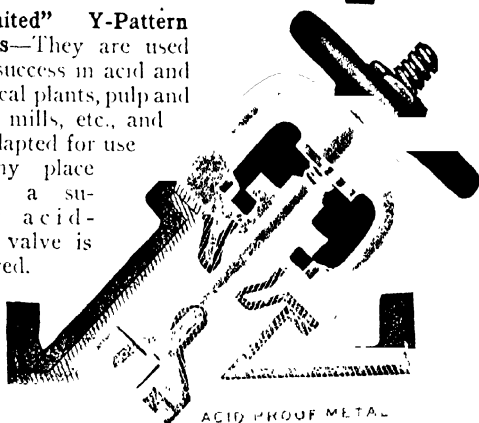
ANGLE PATTERN—PLUG AND SEAT TYPE

"United" Y" Pattern or Freeflow Acid Valves are recommended where a full-way valve is desired. They have a clean unobstructed passage which gives the maximum capacity with a minimum amount of resistance.



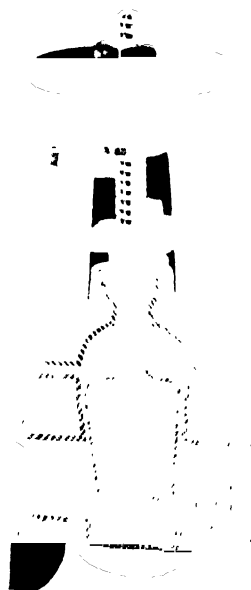
Y-PATTERN—PLUG AND SEAT TYPE

"United" Y-Pattern Valves—They are used with success in acid and chemical plants, pulp and paper mills, etc., and are adapted for use in any place where a superior acid-proof valve is required.



Y-PATTERN—DISC TYPE

We confidently recommend United Acid Valves with the assurance that they will meet in every way the severe tests and conditions encountered where liquids of a searching or corrosive nature are handled.



GATE PATTERN

"United" Block Tin Lined Valves—"United" Acid Valves can also be furnished with a heavy lining of pure block tin for the handling of Acetic and Citric Acids, Acid Gases, Food Products, Fruit Juices and distilled or hot water.

Special Acid Valves made and lined in accordance with engineer's specifications or designs.

#### "UNITED" HARD LEAD PLUG COCKS AND BIBBS

Adapted for contact with acid where they are opened or used infrequently. Where the stress caused by operation is sufficiently severe, the installation of "United" acid-proof valves is recommended.

In addition to flanged types illustrated we manufacture Straight Plug Cocks and Plain Plug Bibbs, also special Flanged Hard Lead Taper Shank Cocks with bronze couplings, lead faced.



FLANGED PLUG BIBB



FLANGED PLUG COCK

*Continued on Next Page*

# UNITED STATES CAST IRON PIPE AND FOUNDRY CO.

GENERAL OFFICES: BURLINGTON, NEW JERSEY

## SALES OFFICES

Philadelphia, Pa., 1421 Chestnut Street  
New York, N. Y., 71 Broadway  
Pittsburgh, Pa., Henry W. Oliver Bldg  
Chicago, Ill., 125 N. Michigan Blvd  
Buffalo, N. Y., 927 E. Ferry Street

Cleveland, Ohio, 1150 E. 26th Street

Birmingham, Ala., American Trust Bldg  
St. Louis, Mo., Security Bldg  
San Francisco, Cal., Monadnock Bldg  
Minneapolis, Minn., Plymouth Bldg  
Dallas, Texas, Scollard Bldg

## WORKS

Addyston, Ohio  
Anniston, Ala.

Birmingham, Ala.  
Buffalo, N. Y.  
Bessemer, Ala.

Chattanooga, Tenn.  
Cleveland, Ohio  
Burlington, N. J.

Louisville, Ky.  
Scottsdale, Pa.  
Columbus, Ohio

## PRODUCTS

"Usicast" Castings to Engineer's Designs, including Chemical, Sugar House and Miscellaneous Castings.

Barometric Condenser furnished complete.

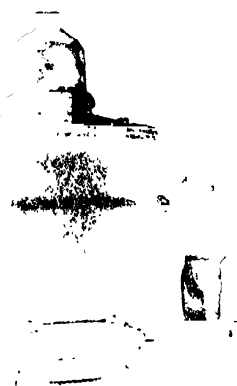
Cast Iron Pipe and Fittings, 2" to 84" in diameter, Bell and Spigot; Flanged; Screw or Plain End; Flexible Joint; Standard or Special.

**"USICAST"**  
CHEMICAL CASTINGS

We are prepared to furnish Usicast chemical castings in any size up to 50 tons, for all chemical purposes in accordance with designs or specifications

submitted by the customer and are glad to cooperate in the details of design with our customers' Engineering Department if desired.

To meet special conditions of service, or of the chemical process involved, the raw material is selected after careful analysis in our chemical laboratory, and the



**DIGESTER**

72 inches in diameter, 10 feet high

## STANDARD THICKNESS AND WEIGHT OF CAST IRON PIPE

Nominal Inside Diameter, Inches	Class A					Class B					Class C					Class D				
	100 Foot Head 41 Lbs. Pressure					200 Foot Head 86 Lbs. Pressure					300 Foot Head 130 Lbs. Pressure					400 Foot Head 173 Lbs. Pressure				
	Pounds					Pounds					Pounds					Pounds				
	Weight					Weight					Weight					Weight				
	Thickness Inches	Foot	Bell	Single Flange	Per	Thickness Inches	Foot	Bell	Single Flange	Per	Thickness Inches	Foot	Bell	Single Flange	Per	Thickness Inches	Foot	Bell	Single Flange	Per
3	.39	13.0	18.8	6.4	42	.42	14.6	19.3	6.2	45	.45	15.5	19.3	6.2	48	.48	16.4	19.3	6.2	
4	.42	18.0	20.4	11.1	45	.45	20.1	22.9	10.7	48	.48	21.3	22.9	10.7	52	.52	22.8	22.9	10.7	
6	.44	27.9	28.9	15.0	48	.48	31.1	32.9	14.4	51	.51	32.9	32.9	14.4	55	.55	35.3	32.9	14.4	
8	.46	38.7	43.5	23.1	51	.51	42.7	43.5	23.1	56	.56	48.0	51.6	22.0	60	.60	51.2	51.6	22.0	
10	.50	51.9	57.9	32.2	57	.57	58.8	57.9	32.2	62	.62	65.5	65.4	30.6	68	.68	71.1	65.4	30.6	
12	.54	67.0	70.9	47.7	62	.62	76.4	70.9	47.7	68	.68	85.4	85.1	45.6	.75	.75	93.7	85.1	45.6	
14	.57	82.3	87.8	58.1	66	.66	94.7	87.8	58.1	74	.74	108.1	95.8	55.1	.82	.82	119.2	95.8	55.1	
16	.60	98.8	111.1	73.2	70	.70	114.6	111.1	73.2	80	.80	133.3	128.1	69.1	.89	.89	147.5	128.1	69.1	
18	.64	118.3	134.5	78.1	75	.75	137.8	134.5	78.1	87	.87	162.4	152.5	72.8	.96	.96	178.1	152.5	72.8	
20	.67	137.4	158.2	99.8	80	.80	163.1	158.2	99.8	92	.92	190.6	180.2	92.9	1.03	1.03	212.3	189.2	92.9	
24	.76	187	202	137	89	.89	217	202	137	1.04	1.04	258	253	127	1.16	1.16	286	253	127	
30	.88	266	296	214	1.03	1.03	313	298	207	1.20	1.20	367	351	196	1.37	1.37	421	413	186	
36	.99	359	383	327	1.15	1.15	419	411	315	1.36	1.36	498	511	300	1.58	1.58	582	584	283	
42	1.10	465	537	459	1.28	1.28	542	584	444	1.54	1.54	657	696	415	1.78	1.78	764	796	392	
48	1.26	608	663	556	1.42	1.42	687	748	539	1.71	1.71	833	899	504	1.96	1.96	961	1034	471	
54	1.35	732	847	722	1.55	1.55	844	989	691	1.90	1.90	1041	1181	642	2.23	2.23	1228	1382	600	
60	1.39	837	1007	884	1.67	1.67	1010	1141	838	2.00	2.00	1219	1390	770	2.38	2.38	1457	1647	719	
72	1.62	1171	1346	1291	1.95	1.95	1415	1588	1219	2.39	2.39	1745	1936	1123	2.82	2.82	2071	2302	1028	
84	1.72	1447	1776	1810	2.22	2.22	1878	2218	1670	2.74	2.74	2332	2688	1521	3.24	3.24	2774	3249	1381	

Standard length 12 feet

Weights per foot listed above are for the barrel and do not include any allowance for bell.

melting of the iron is carried on under the direct supervision of our metallurgist to insure the best mixture for the casting.

The illustrations shown represent the size and variety of castings we have made and supplied to various satisfied customers for a number of years. We



CRYSTALLIZING PAN



MUSHROOM PLATE

make castings of intricate design requiring skilled workmanship and high grade machining. All blue-prints are held in strict confidence and specifications are carefully adhered to.



EVAPORATOR SECTIONS COMPLETE

#### "USICAST" SUGAR HOUSE CASTINGS

Our shops are well equipped for manufacturing large evaporators, vacuum pans, and filters required for sugar house work. Much of the sugar material is for export and our plants are admirably located to handle such shipments.



TRIPLE EFFECT EVAPORATORS

#### BAROMETRIC CONDENSERS

The patented features of our Barometric Condenser make it especially adaptable to evaporation processes where the absolute pressure in the evaporating chamber should be constant and where the degree of vacuum should be maximum for the amount of cooling water consumed.

SO<sub>2</sub> GAS COOLERS

#### CHEMICAL PIPING

Cast Iron Pipe is used successfully in the chemical industry for the conveying of gases, acids and other corrosive chemical solutions.

It is especially adaptable to sulphuric acid installations, being used for carrying both the hot and cold SO<sub>2</sub> gas and acid.

On account of its heat resisting properties it is also widely used in high temperature processes. It is used successfully at temperatures between 1200° and 1400° F. and in cases where the temperature does not vary appreciably it has been used with success as high as 1800° F.

In sugar house work U. S. Cast Iron Pipe is useful not only in conveying the various solutions but also to handle the steam and water supply.



CAST IRON PIPE IN A SULPHUR BURNER INSTALLATION

# UNITED STATES RUBBER COMPANY

1790 BROADWAY, NEW YORK, N. Y.

Cable Address: "USRU RUB" New York

BRANCHES IN EVERY INDUSTRIAL CENTER



## PRODUCTS

Transmission, Conveyor and Elevator Belting  
Packings and Pump Valves  
Acid Hose

Hard Rubber Goods—Tanks, Dippers, Pitchers, Buckets, Dye Sticks, Pipe and Fittings, Sheet, Rod, Tubing, Molded and Turned Articles.

We also manufacture air hose, water hose, steam hose, fire hose, and hose for every other purpose, acid gloves, special rubber boots, friction tape and splicing compound, plumbers' specialties, rubber tiling, mats and matting and a large variety of miscellaneous molded rubber specialties.

## SERVICE

In every industrial center you will find a United States Rubber Company branch ready to serve you

## TRANSMISSION BELTING

Power economy is gained only by transmission efficiency. The highest belting efficiency is reached with a Rainbow Friction Surface Belt, if properly installed.

Rainbow Belting is a properly balanced combination of duck and rubber, designed for severe transmission service.

Rainbow is uniform in construction and possesses high tensile strength with minimum stretch. It runs true, grips the pulley and delivers full power.

Our belting men will be glad to inspect the transmission conditions of your plant and make a belting recommendation.

For high speed over small pulleys we recommend our Pilot Belt.



RAINBOW BELT ON BEATER DRIVE IN PAPER MILL

## CONVEYOR AND ELEVATOR BELTS

The greatest step toward increasing the efficiency of conveyor and elevator belts is our new method of constructing every U. S. Belt for the particular service it is to perform.



U S COAL CONVEYOR BELT IN MUNICIPAL POWER PLANT

The operating speed of every conveyor belt, the character of material to be handled, the angle at which the belt operates, the arrangement and number of idlers, the direction of the load and the position of the drive—all are taken into account by our engineers. They

will be glad to cooperate with you in specifying the right belt for every service.

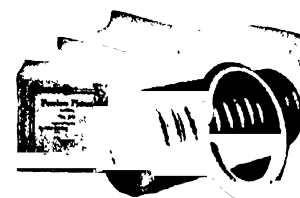
## PACKINGS AND PUMP VALVES

United States Rubber Company Packings have been thoroughly tested under practically every mechanical condition. All have proven their merit but certain styles or brands are recommended as being particularly good for certain conditions. There is a tested type of United States Packing to meet practically every mechanical need.

Our engineers are at your service to aid you in determining the most suitable style or brand to meet each of your requirements.

Simplify your packing problems by specifying United States Packings.

U.S. Rubber Pump Valves are made in a variety of compounds, each adapted for a particular condition.



PEERLESS PISTON PACKING

## ACID HOSE

Giant Acid Hose has a very high grade rubber lining made to give maximum service under the conditions that it is required to meet. Giant is made with various thicknesses of tube to resist the action of various acids and dyestuffs. Its construction is determined in every instance by the kind, strength, and temperature of the acid or liquid to be conducted.



GIANT ACID HOSE

*Continued on Next Page*



### HARD RUBBER PRODUCTS

Hard rubber, being one of the best known acid resisting substances, has contributed very materially to the wonderful progress made by chemists. Hard rubber valves and fittings are being used more and more to handle hydrochloric acid and other chloride liquids which attack all the ordinary materials of construction. The United States Rubber Company manufactures a large variety of hard rubber products and is prepared to manufacture special apparatus according to customers' specifications.

### TANKS

Hard rubber tanks can be made in many sizes and designs. We also line steel tanks with hard rubber.

### HARD RUBBER DIPPERS

Hard rubber dippers are found very serviceable for dipping acids and chemicals. Our standard dipper is of two quart capacity but we can also manufacture dippers of any size desired.

DIPPER

### HARD RUBBER PITCHERS

We manufacture a standard three quart pitcher but also make pitchers of larger capacity. Chemists find them very useful in their work.

PITCHER

### HARD RUBBER BUCKETS

Our buckets for handling acids and other chemicals are tapered and come with or without the spout, as specified. They are heavily reenforced at the top and are equipped with a very strong hard rubber handle which has a steel core. The standard sizes are as follows, but special sizes can also be furnished:

BUCKET

2 Gallon  $\frac{1}{2}$ " Wall 7 x 8 x 11 O. D.  
3 "  $\frac{1}{2}$ " " 8 x  $9\frac{1}{2}$  x 12 O. D.  
4 "  $\frac{1}{2}$ " " 9 x  $10\frac{1}{2}$  x 13 O. D.

### HARD RUBBER DYE STICKS

Our patented hard rubber dye stick is a great improvement over the old wooden stick. It is made of a

DYE STICK

One End Cut Away to Show Wooden Core

wooden rod on which hard rubber is vulcanized. It is strong, yet light, and the semi-soft rubber bumpers on the ends prevent breaking and chipping when the stick is dropped on the floor. The standard size is 42 inches long, one inch inside diameter and  $1\frac{1}{8}$  inches outside diameter. Other sizes furnished if desired.

### PIPE AND FITTINGS

Hard rubber pipe is usually furnished in 8 foot lengths but can be made in any length up to 10 feet.

All hard rubber pipe lines should be supported. A plain wooden support is recommended. Our pipe fittings, which include unions, tees, couplings elbows, and cocks, are made very strong and are threaded to fit pipe.

ELBOW

#### APPROXIMATE SIZES OF HARD RUBBER PIPE

Pipe	Inside Diameter	Outside Diameter
$\frac{1}{8}$ "	$\frac{3}{8}$ "	$\frac{5}{8}$ "
$\frac{1}{4}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "
$\frac{3}{8}$ "	$\frac{3}{4}$ "	$1\frac{1}{4}$ "
$\frac{1}{2}$ "	$1\frac{1}{8}$ "	$1\frac{1}{2}$ "
$\frac{3}{4}$ "	$1\frac{3}{8}$ "	$1\frac{7}{8}$ "
$1\frac{1}{4}$ "	$1\frac{7}{8}$ "	$2\frac{1}{8}$ "
$1\frac{3}{4}$ "	$2\frac{1}{8}$ "	$2\frac{3}{4}$ "
$2\frac{1}{4}$ "	$2\frac{3}{4}$ "	$3\frac{1}{4}$ "
$3\frac{1}{4}$ "	$3\frac{1}{4}$ "	$4\frac{1}{4}$ "

The inside diameter of hard rubber pipe usually runs a trifle under the dimensions specified, the same as in iron pipe. This is in order that the wall will be heavy enough to sustain threading of the iron pipe size threads.

### SHEET, ROD AND TUBING

Chemists frequently require pieces of hard rubber sheet, rods and tubing cut into certain sizes to meet special conditions. We are in a position to furnish this promptly and to almost any specifications.

### MOLDED AND TURNED ARTICLES

Many special articles can be molded and machined from hard rubber to meet special conditions in chemical plants.

# THE UNITED STATES AND CUBAN ALLIED WORKS ENGINEERING CORPORATION

Krajewski Sugar Corporation

Bradford Works

OWNING AND OPERATING

WORKS

Havana Dry Dock Company

Havana Iron Works

Bradford, Pa., and Havana, Cuba

## NEW YORK OFFICES

165 Broadway

Cable "HOLWAX," New York and Havana

### PRODUCTS

Evaporators and Vacuum Pans for Concentration of any Liquid.

Centrifugals for all requirements of the chemical, sugar and other industries.

Krajewski Sugar Cane Crushers and Mills.

Sugar Machinery; Complete Sugar Factory Equipment.

Air Compressors, Centrifugal Pumps, Filters, Vacuum Pumps.

Tanks, Towers and Steel Plate Work of all kinds.

Industrial Chemical Plants, Sugar Factories and Steel Construction erected in any part of the world.

### ENGINEERING AND CONTRACTING

This corporation, having the services of an able engineering corps, will be pleased to take up problems of reconstruction and new building wherever they may arise. Our special engineering field lies in sanitation, water supply, sewerage, erection of piers, warehouses, terminals, and all steel frame and concrete construction.

### KRAJEWSKI SUGAR MACHINERY

Krajewski is one of the best known names in the sugar machinery world. The firm has been in active and continuous existence since 1861.



KRAJEWSKI ELECTRIFIED  
MILLING PLANT FOR CANE  
SUGAR CENTRALS

### "UNITED" AIR COMPRESSORS

All "United" air compressors are constructed with entirely enclosed dustproof type of frame. Moving parts are flooded continuously with oil and lubrication starts and stops without attention.

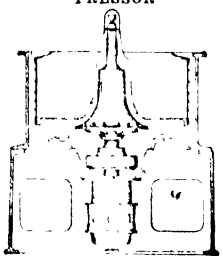


CLASS DN—SINGLE STAGE STEAM-  
DRIVEN COMPRESSOR

CLASS CN—TWO-STAGE  
POWER-DRIVEN COM-  
PRESSOR

### D'OLIER ELECTRICALLY DRIVEN HYDRO-EX- TRACTORS

These machines represent high engineering skill and the best mechanical construction. The center of gravity is low with less possibility of vibration. There is unobstructed access to basket.



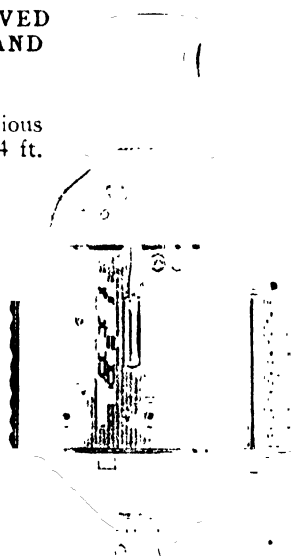
D'OLIER HYDRO-EX-  
TRACTOR

### KRAJEWSKI IMPROVED COIL VACUUM PAN AND MULTIPLE EFFECT EVAPORATORS

This pan is built in various sizes from 5 ft. up to 14 ft. diameter as required.

There is an excellent circulation of the massecuite. The sectional coils insure quick drainage. There is an efficient separator on the vapor outlet. The pan has a large discharge opening.

We also build vacuum pans with calandrias and coils, and triple and quadruple effects ranging in size from 1500 sq. ft. to 26,000 sq. ft. of heating surface.



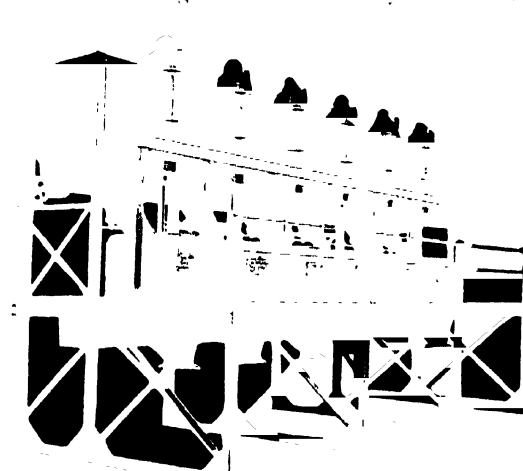
KRAJEWSKI COIL VACUUM PAN

### STANDARD WESTON CENTRIFUGALS

Every improved feature is embodied in the design and construction of our Standard Weston Centrifugals. All parts of these Machines are manufactured in our own works.

They are made with belt, water or motor drive. Motor driven units are equipped with standard motors having a simple and effective control. In the belt-driven units, pulley and brake are made in one piece and so designed as to insure thorough self-cooling, thus prolonging the life of the belt.

All the rotating elements are easily accessible.



BATTERY OF SIX DIRECT CONNECTED ELECTRIC MOTOR-  
DRIVEN STANDARD WESTON CENTRIFUGAL MACHINES

# VALLEZ ROTARY FILTER PRESS

The Vallez Rotary Filter Press

205 Mountain Street

BAY CITY, MICH.

## PRODUCT

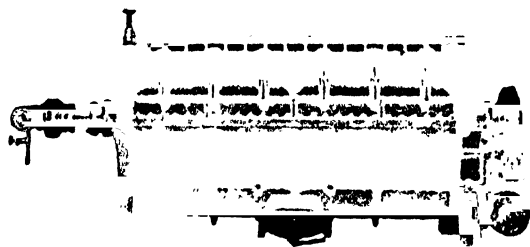
Vallez Rotary Filter Press

## CONSTRUCTION

This filter press is made of a cast iron cylinder, divided on the horizontal center line into two halves.

The top half is provided with inspection doors on the side, and a series of sprays located on the top. These sprays are connected to a header which is connected with water or compressed air.

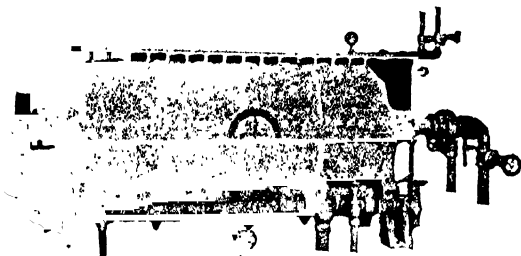
The lower half has a trough on the bottom. In this trough a right and left screw is provided to remove the cakes through a door situated in the middle and at the bottom. The right and left screw is provided with gears for driving it.



EXTERIOR FRONT VIEW VALLEZ ROTARY FILTER PRESS  
Note inspection doors

The filtering element is composed of a series of frames mounted on a hollow shaft. These frames are spaced  $2\frac{1}{2}$ ", 3" or 6" apart, according to the material to be filtered. The hollow shaft is connected on one end with two or three outlet pipes. The frames are made of two perforated plates, with a coarse screen between to keep them apart and are provided with proper opening to connect the inside of the frames with the hollow shaft. Cotton cloth or metallic cloth is used, according to material to be filtered.

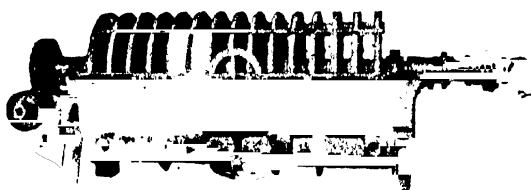
The bottom of the press is provided with a header, connecting at four places at the bottom of the filter. In this header are the proper inlet and outlet valves.



EXTERIOR REAR VIEW VALLEZ ROTARY FILTER PRESS  
Note header

## OPERATION

The filter being closed, the juice is admitted at the bottom and fills the press, the air being let out by a small valve on top of the filter. The liquid filters through the frames and then goes out through the hollow shaft. The cakes form on the frames. To know when the press is full, a small paddle, situated between two of the frames, rests on the surface of one frame, and as the cake gets thicker the paddle raises from the frame and moves an indicating needle outside, showing the thickness of the cake all of the time. When the press is full, the excess liquid is evacuated by using compressed air, and water is introduced to wash the cake. After the cake is washed, the excess water is removed by compressed air. The center door is then opened, the screw started and the cakes loosened by the spray pipes, using water at 60 pounds pressure, if cakes do not need to be removed dry. If cakes have to be removed dry, compressed air at 150 pounds pressure is used instead of water. When the filter is to be used to filter syrup where the sediment is very small, the frames are coated with Kieselgur, and the liquid is filtered through this film of Kieselgur. During the filtration the frames revolve at the rate of  $1\frac{1}{2}$  r. p. m.



INTERIOR REAR VIEW VALLEZ ROTARY FILTER PRESS  
Note filtering element

## ADVANTAGES

The advantages of the Vallez Filter are many.

The main one is labor saving.

Less water to wash the cakes (and they are perfect in thickness).

Saving of cloths, as the cloths are washed in the filter without removal.

Perfect filtration. Every drop of filtered liquid is as clear as crystal.

Least cost of maintenance.

Perfect filter to insulate, if needed.

Very clean installation.

The Vallez Filter can be used for almost any filtration of different manufactures, and makes a splendid filter for syrups, such as sugar factory syrup, malt syrup, etc.

Before deciding on your filtration requirement, refer to us for information.

This filter is made in different sizes:

A laboratory size 16" in diameter by 30" long.

The largest size 45" in diameter by 10' long.

# E. B. VAN ATTA & CO., INC.

Manufacturers of Hydraulic Presses, Pumps, Accumulators  
and Other Hydraulic Appliances

MAIN OFFICE AND FACTORY

OLEAN, N. Y.

BRANCH OFFICE, 50 Church St., NEW YORK, N. Y.

## PRODUCTS

Hydraulic Presses, Pumps, Valves, Accumulators,  
and Intensifiers.

## GLUING PRESSES

Cold Process Veneer  
Waterproof Veneer—hot process

## VULCANIZING PRESSES

Rubber  
Hard Fibre

## FRUIT PRESSES

Cider  
Grape  
And other fruit juices

## BALING PRESSES

Cloth  
Paper  
Metal Scrap

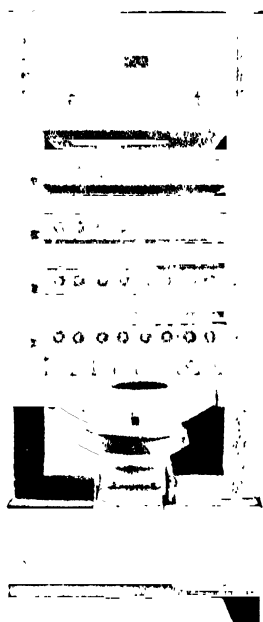
## EXTRACTING PRESSES

Asbestos Board  
Wood Pulp  
Paper Pulp  
Tankage  
Garbage  
Grease  
Scrap  
Leather  
Oil

## STEEL STEAM PLATES

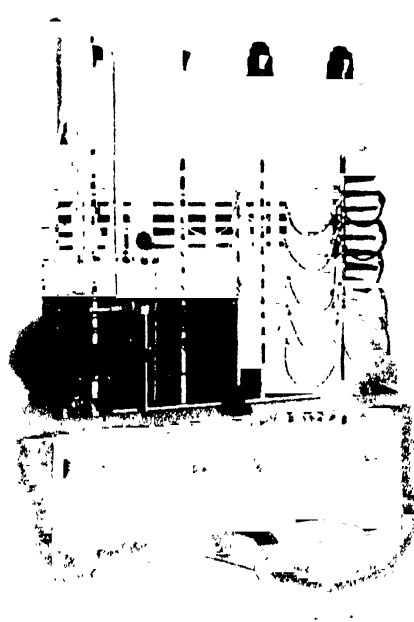
## SPECIAL PURPOSES

We are prepared to design and build hydraulic presses  
of any size and tonnage for any purpose for which it is  
practical to use hydraulic pressure.



**HOT PLATE PRESS**

Four Openings for Rubber Vulcanizing and Heating Other Materials  
under Pressure



**HOT PLATE PRESS**

Ten Openings for Waterproof Glue Veneer, and other Processes  
requiring heat under pressure

# VENDOME COPPER AND BRASS WORKS

Coppersmith, Boiler and Tank Works

721-723-725-727 E. MAIN ST., LOUISVILLE, KENTUCKY

## PRODUCTS

Chemical Equipment of Copper and Brass, Boiler and Tank Work; such as Distilling, Rectifying, Extracting, Dissolving, Evaporating, Heating and Cooling Apparatus.

Still, Kettles, Columns, Autoclaves, Tanks and Piping of Copper and Brass.

Sheet Copper: Seamless Copper and Brass Tubes.

## FACILITIES

We have had a long and successful experience in building equipment of the above classes. Our shop is equipped to handle any construction of this kind. Our workmen are skilful and careful. We carry at all times a large stock of sheet copper and copper and brass tubing, and can execute orders placed with us promptly.

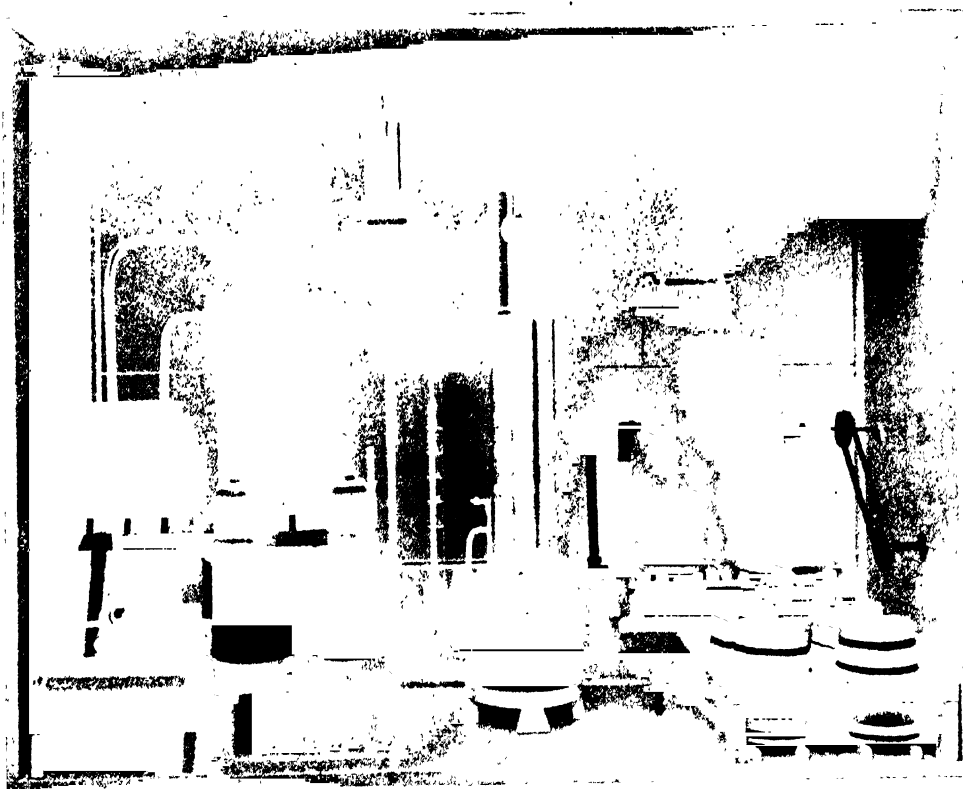
## SERVICE

We can cooperate with chemists and engineers who are building, altering or designing plants in which copper or brass equipment or boiler and tank work is needed.

Repair work and reconstruction will have our careful attention at all times.

Submit us your designs and allow us to estimate on them. You will find our prices altogether reasonable and our service prompt, intelligent and courteous.

Sometimes we may be able to suggest changes in designs that will enable them to be executed more economically. Our long experience with copper distillation equipment enables us to do this.



COMPLETE DISTILLERY

# THE VILTER MANUFACTURING COMPANY

891-897 Clinton Street  
MILWAUKEE, WISCONSIN

## BRANCH OFFICES

220 Broadway,  
New York, N. Y.  
10th and Chestnut Sts.,  
Philadelphia, Pa.

324 Finance Bldg.,  
Kansas City, Mo.  
731 Monadnock Block,  
Chicago, Ill.

2723 Bennett Court,  
St. Louis, Mo.  
707 Globe Bldg.,  
Minneapolis, Minn.

2650 Santa Fe Ave.  
Los Angeles, Cal.  
24 West Broadway,  
Salt Lake City, Utah

419 Commercial Bank Bldg.  
Houston, Texas  
106 West Roy St.  
Seattle, Wash.

314 Curry Building,  
Pittsburgh, Pa.  
Wellington,  
New Zealand

**PRODUCTS:** Vilter Ice Making and Refrigerating Machinery, Ammonia Valve and Fittings, Ammonia Condensers, Brine Coolers, Vilter Corliss Engines, Vilter Poppet Valve Engines, Special Machinery, Oil Coolers.

### VILTER HORIZONTAL HIGH SPEED AMMONIA COMPRESSOR:

All accepted principles of refrigerating machinery construction, and all subsequent, consistent developments and improvements find embodiment in Vilter Horizontal High Speed Ammonia Compressors. They are specially designed for direct connection to the newest types of high speed prime movers, and particularly adapted for direct connection to synchronous motors, a method of drive which is proving so highly economical and efficient.

Vilter High Speed Ammonia Compressor

### VILTER ROLLING MILL TYPE COMPRESSOR:

The rolling mill frame machine is built along very heavy lines for all conditions of service. It is used with only slight modifications in all sizes of compressors. Its very appearance gives assurance and proof of its strength and reliability. All parts of the base rest upon the foundation, thus giving a uniform distribution of the load and insuring maximum stability and rigidity.

Vilter Ammonia Compressor, Direct Connected Corliss Engine

### VILTER CORLISS ENGINE:

The Rolling Mill frame Corliss engine is of exceptionally massive construction and adapted for any class of service, from the steady belted load to direct connected electric service, in which the engine is subjected to heavy and extremely variable loads. Built for high steam pressures and high rotative speeds.

The valve gear is of high speed type, and all valves are double ported. Built in many sizes, either simple, tandem compound or cross compound.

The Girdler frame Corliss engine is strong and rigid and designed to take shocks and overloads without possibility of misalignment. Made in sizes from 25 H.P. up.

### VILTER POPPET VALVE ENGINE:

The Poppet Valve engine operates with high steam pressure and superheat, and is remarkable for its low steam consumption and in the reduction of the number of its working parts to about 66% of the number used in other designs.

Simple Compressor, Direct Connected to Tandem Compound Engine with High Pressure Poppet Valve Cylinder and Low Pressure Corliss Cylinder

### VILTER VERTICAL SINGLE ACTING TWIN CYLINDER AMMONIA COMPRESSOR:

A vertical single acting compressor specially designed for users of comparatively small quantities of refrigeration. Built in sizes from 1 ton to 20 tons capacity per 24 hours.

### VILTER LOW TEMPERATURE COMPRESSION SYSTEM:

A system manufactured under D. L. Davis patents whereby extremely low temperatures are efficiently and economically produced with compression refrigerating machinery. The simple ammonia compression machine has been conceded as both expensive and uneconomical for low temperature work. These detrimental features are overcome by the Low Temperature Compression System by the following methods:

- (1) Multistage compression, which increases volumetric efficiency and reduces the power required for operating the compressors.
- (2) Cooling the liquid before entering the low temperature refrigerator, thus reducing amount of gas handled by low pressure compressor and power per ton of refrigeration—because the work of cooling is handled by the high pressure cylinder.
- (3) Proper traps, etc

Bulletins, catalogs and full data regarding our products will be mailed on request.

Vilter Twin Cylinder Ammonia Compressor, Small Capacity

# THE VITREOUS ENAMELING COMPANY

FACTORY AND GENERAL OFFICES

CLEVELAND, OHIO

## PRODUCTS

**Pans for Vacuum, Shelf or Tunnel Dryers, Vitreous Enameled Steel Evaporating Pans, Pigment Drying Trays, Commercial Photograph Developing Trays, etc., Non-Corroding Chemical Resisting Trays or Pans for Dyestuff and Paint Manufacturers, Manufacturing Chemists and Allied industries.**

## FINISH

**Vitreous** Pans and Trays Enameled Dark Blue.

In 1917, recognizing the need of an evaporating pan or drying tray that would resist chemical action and at the same time stand more than the ordinary amount of rough handling, we brought out the **Vitreous** Enameled Pans and Trays. That they filled a long felt want is attested to from the fact that hundreds of Chemical Plants, Paint Manufacturers, Laboratories and Manufacturing Chemists, here and abroad, are now using our product to the exclusion of all other kinds. **Vitreous** Pans and Perforated Trays (Patented) are no longer an experiment, but an actual necessity in plants where shelf, vacuum or tunnel dryers are in operation.

Aside from the tremendous saving in equipment, the use of **Vitreous** Pans means

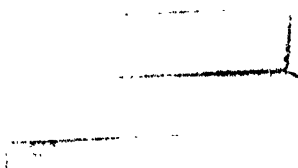
- Reduced manufacturing costs
- Cleaner material
- Absence of corrosion
- Ease of cleansing
- Freedom from adhesion
- (and where wooden trays are used)
- Lessened fire risk

Let us send you a sample for trial.

## EVAPORATING PANS

Reinforced welded corners, an exceptionally strong and durable pan.

Manufactured to order in any size.



EVAPORATING PAN

## PIGMENT DRYING TRAYS

Made with curled edge on all sides to facilitate easy and quick handling. Especially recommended for pigment drying and other compressed products where flat drying surface is desired.

Manufactured to order in any size, plain or perforated. (Patented.)

PIGMENT DRYING TRAY

## LIPPED DEVELOPING PANS

Made with flaring sides, heavy curled edges and lip. Admirably suited for Pharmaceutical work, Photographic developing, etc. Furnished in any size required.

LIPPED DEVELOPING PAN

# HENRY VOGT MACHINE COMPANY

Oil Refinery Equipment: Water Tube and Horizontal Return Tubular Boilers:  
Refrigerating Machinery: Drop Forged Steel Valves and Fittings

LOUISVILLE, KENTUCKY

BRANCH OFFICES

New York, N. Y.

Chicago, Ill.

Tulsa, Okla.

## PRODUCTS

Oil Refinery Equipment—Paraffine Wax Presses—Distillate Wax Chilling Machines for cold test oils, Steam and Crude Stills, Auto Truck Tanks, Agitators, Condenser Boxes and welded vessels. Water Tube and Horizontal Return Tubular Boilers—Sectional Steel Casings—Sectional Shaking and Dumping Grates—Steel Stacks and Tanks—Refrigerating Machinery—Exhaust Steam Ammonia Generators, Aqua Ammonia Pumps and Drop Forged Steel Valves and Fittings.

## REFRIGERATION

Forty years of effort in the design and construction of the Vogt Absorption Machine has brought forth the present economical and efficient exhaust steam unit. By an exhaust steam unit is meant a refrigerating machine capable of developing its rated capacity through the use of steam that has already performed useful work.



100 TON VOGT EXHAUST STEAM REFRIGERATING MACHINE

A further economy is effected by combining the exhaust steam refrigerating machine with any mill, light or power plant, the refrigeration or ice so produced being virtually a by-product. When it is understood that the operation of such a machine is possible without the introduction of any complicated parts, our correctness of design is thoroughly established.

The workmanship and material used on our machines are of the very best, our Drop Forged Valves and Fittings being one of the superior features.

## VOGT EXHAUST STEAM AMMONIA GENERATOR (Patented)

Designed to operate on the lowest possible steam pressure. The shell and heads are made of semi-steel, this metal being the most durable in contact with hot ammonia.

The coil is made of straight extra heavy wrought iron pipe, and each pipe is closed at one end. The steam is delivered through an inside pipe at the closed end and travels only one time the length of the generator. This eliminates the friction and enables operation at minimum pressure.



VOGT EXHAUST STEAM AMMONIA GENERATOR

# Vogt

Other special features are: no return bends, no bent pipes, no exposed heating surface, no stuffing boxes on steam coils; no threaded joints inside of shell.

## VOGT AQUA AMMONIA PUMP

The Vogt aqua ammonia pump is designed to handle strong aqua ammonia.

The steam cylinder is equipped with balanced piston type valve, governed by an auxiliary valve that is mechanically operated. The steam consumption is considerably low for this type pump, and the speed is automatically controlled at any desired number of strokes by means of a mason regulator. The ammonia cylinder is provided with an extra long stuffing box and water chamber. The ammonia piston rod is made of special steel and connected with coupling to the steam piston rod so it can be easily removed when necessary. The pump is mounted on a heavy base.



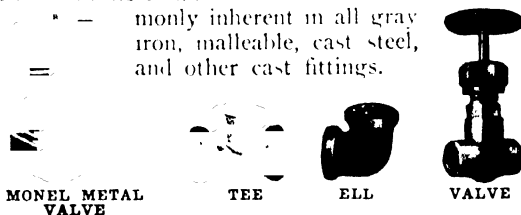
VOGT AQUA AMMONIA PUMP

## VOGT DROP FORGED STEEL VALVES AND FITTINGS

These valves and fittings embody every feature and improvement that assures efficient and enduring service. They fulfil the most exacting requirements of high pressures and temperatures of oil, gas, ammonia, air, water, steam and superheated steam.

Vogt Fittings are absolutely guaranteed not to leak when properly installed. They are scientifically forged from open hearth steel of high tensile strength, which makes them proof against shrinkage cracks, blow or air holes and other defects and flaws com-

monly inherent in all gray iron, malleable, cast steel, and other cast fittings.



MONEL METAL VALVE

TEE

ELL

VALVE

## THE VOGT MONEL METAL VALVE

The stem, disc, and seat of this Valve are Monel Metal. The heat and acid resisting qualities of the Monel Metal parts, together with a Drop Forged Body, Packing Nut and Bonnet, all high grade steel, make it a superior Valve for work in acids and high pressures in superheated steam. These features, acid resisting combined with drop forged strength, assure safety, endurance, and long service.

The Monel Metal parts are indicated by white arrows in the above cut of the valve.

*Continued on Next Page*



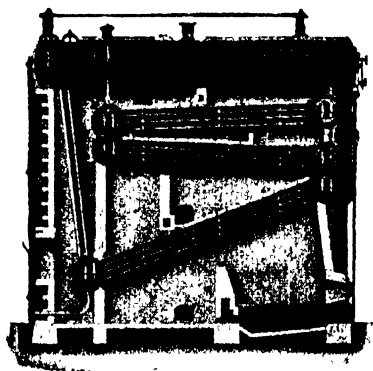
**THE VOGT WATER TUBE BOILER**

The success of the Vogt Water Tube Boiler is built on the following service rendering features:

High efficiency resulting from design of boiler, arrangement of furnace

Counter current circulation, and proper proportionment of gas passage areas

Extremely large steam storage space for fluctuating load



VOGT WATER TUBE BOILER

Low maintenance cost due to absence of all curved tubes and numerous handholes, and freedom of boiler for expansion and contraction.

Easily accessible for cleaning and inspection

Able to "pick up" from dead load to peak load in shortest possible time.

Manufactured by the most advanced boiler shop practise from highest grade material

The Vogt Water Tube Boiler is constructed in units varying from 250 to 1000 horsepower, and complies in every respect with the A. S. M. E. Boiler Code.

**THE VOGT HORIZONTAL RETURN TUBULAR BOILER**

Vogt Horizontal Return Tubular Boilers are constructed in accordance with the new A. S. M. E. Boiler Code for 125 and 150 pounds working pressure and range in capacity from 45 to 250 horsepower.



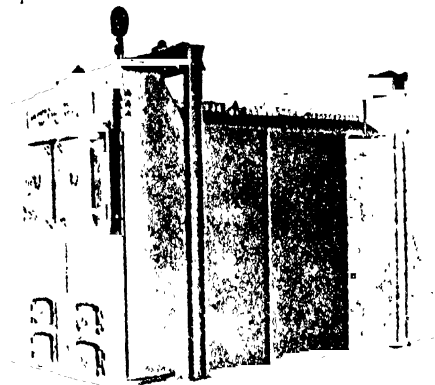
VOGT HORIZONTAL RETURN TUBULAR BOILER

The equipment is arranged to assure ample space between the grates and the bottom of the boiler, also a large combustion area in rear of bridge wall, thus meeting the present day demand for economical fuel consumption.

**THE VOGT SECTIONAL STEEL BOILER CASING**

The necessity that more perfect combustion be obtained has made the elimination of the excess air which leaks through brick boiler setting one of the most important features of boiler setting design. The Vogt Steel Casing for Return Tubular and Water Tube Boilers constitutes a decided step towards se-

curing this more perfect combustion, as it avoids all leaks common to brick settings. A considerable saving in the cost of maintenance and in the elimination of expensive delays is effected since the brick lining



VOGT SECTIONAL STEEL BOILER CASING

of the Steel Casing (being tightly sealed) is not subject to the usual expansion and contraction. Excess air means wasted fuel. Stopping the leaks reduces the coal consumption. Coal saved is Dollars saved, which is a direct return upon the investment.

**VOGT OIL REFINERY EQUIPMENT**

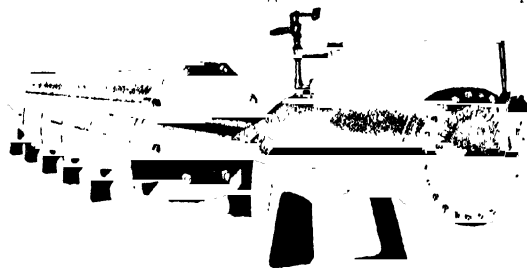
**The Vogt Paraffine Wax Press**—Designed for both efficient and economical service in the work of separating the wax from the wax distillate.

It is adapted to filter under pressure of 300 to 500 pounds. The plates are made in either the loose ring or riveted ring type. The press is heavily constructed and the weight evenly distributed. All castings are made of semi-steel.

**The Vogt Distillate Chilling Machine**—The many installations have proved the excellent working features of this machine. It operates with minimum amount of power.

The distillate pipes (inner pipes) are of wrought iron made in one length. All castings are made of semi-steel.

**The Vogt (Riveted) Auto Truck Tank**—The salient features of this tank are Riveted Joints—High Grade Steel—Modern Design—Master Workmanship.



VOGT PARAFFINE WAX PRESS

**Vogt Tube Pressure Still**—Completely comply with the specifications for pressure vessels of the American Society of Mechanical Engineers. Special equipment made to order.

Bulletins of Vogt Products sent upon request.

# VOLAND & SONS, INC.

Established 1888

Manufacturers of Precision Balances and Weights

FACTORY AND OFFICE

NEW ROCHELLE, N. Y., U. S. A.

Incorporated 1920

## PRODUCTS

Balances; Assay, Analytical, Pulp, Bullion, Etc.

Scales; Gold and Silver.

Weights; Metric Precision, Gramme, Grain, Avoirdupois, Riders.

Balance Pans, Glass Pans.

Balance Accessories.

## PRECISION BALANCES AND WEIGHTS

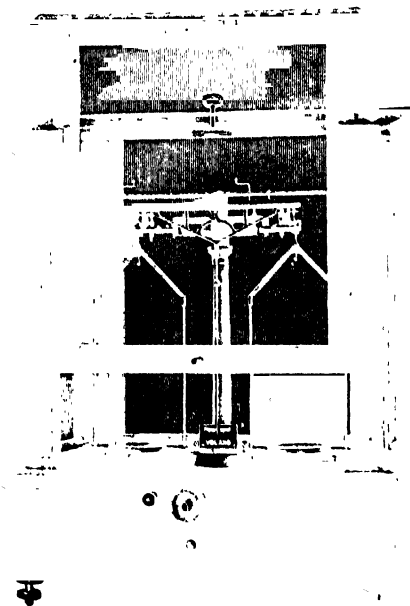
Our balances and weights have gained an enviable reputation for accuracy, perfect construction and expert workmanship. Numerous testimonials and expressions of approval from chemists, chemical engineers, assayers, metallurgists and others are proof of the high quality of our products. We make a very complete line and have an instrument suitable for every purpose where a scientific weighing instrument is required.

### ANALYTICAL BALANCE NO. 1008-A

Capacity 200 Grams in each pan

Sensibility 1/20 Milligram.

Patented rider-hooks and starting attachment. Red graduated index plate; releasing mechanism is the famous arc movement type; all knives relieved of contact when balance is at rest. Bearings are of finest agate, highly polished. Brass parts heavily lacquered;



ANALYTICAL BALANCE NO. 1008-A

Concave pans 2 1/2 inches in diameter and wide enough to take a 4-inch dish

The beam is of our hard bronze composition, accurately made and thoroughly tested and provided with perfectly ground knives of finest agate. Beam is 7 inches long, with white graduations on black background

There are 100 divisions on each side of zero.

Dimensions—Length 16 1/2 inches, height 19 inches; depth 9 1/2 inches

Shipping weight—Domestic 60 lb.; export 70 lb

### "TWENTIETH CENTURY LEADER" ASSAY BALANCE

Sensibility .002 Milligram (1/32000 Gram).

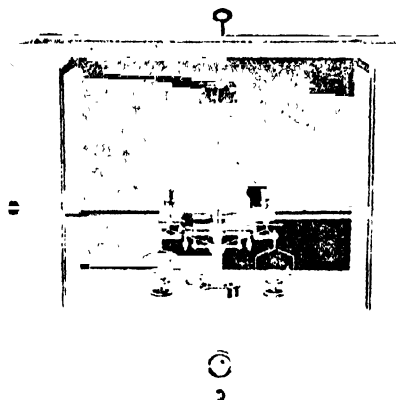
Of the most modern and approved construction of the dwarf column, fallaway type. No sticking or kicking of the pointer. All knives and bearings are of finest agate, highly polished. The construction is non-steel throughout, and practically all the metal parts are heavily plated with gold

The entire balance is mounted on a heavy, black, plate-glass base, located inside the case. The mahogany case is as nearly air-tight and dust-proof as it is possible to make it.

The beam, which is amply reinforced, is of the truss type, made of a hard-rolled, rigid, aluminum alloy. It is graduated into 100 divisions on each side of zero.

Dimensions—Length 16 1/2 inches, height 15 1/2 inches, depth 9 inches.

Shipping weight, 50 lb.; export 60 lb.



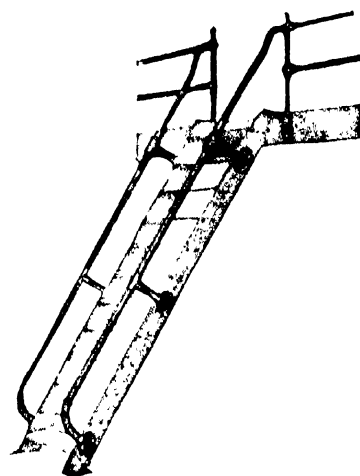
"TWENTIETH CENTURY LEADER" ASSAY BALANCE

# VULCAN RAIL & CONSTRUCTION COMPANY

Grand Street and Garrison Ave.  
MASPETH, N. Y.

## PRODUCTS

Steel Plate Construction.  
Light Structural Steel Work.  
Steel Framing and Supports for Tanks.  
Still, Evaporators, and other chemical equipment as well as Hoppers, Conveyors, and Elevators, etc.  
Steel Gratings, Walkways, Ladders, Stairs, Galleries, etc.  
Pipe, Stair and Bridge Railings.  
Special Pipe Bends.  
Complete Piping for carbon black plants.  
Special pipe construction.



STAIRS WITH BALCONY AND RAILINGS

## SERVICES

We will gladly cooperate with engineering firms when they are building industrial plants, or installing machinery, with the view to supplying them with designs and costs of our products that will fit any requirement.

We carry complete stocks from which to supply the demand for the largest of installations of pipe railings and special steel work.



A BOARDWALK RAILING

## FACILITIES

We have a plant comprising machine shop, forge shop, pipe shop, fabricating shop, pattern shop, together with railroad sidings for handling the largest orders for any of our products.

Our engineering and estimating departments are experienced in handling the unusual in steel construction.

## SPECIAL MACHINERY

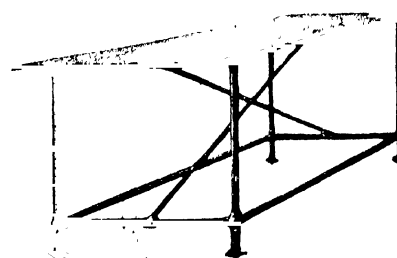
Our engineers build, when required, special machinery for fabricating unusual designs of steel equipment. When you have a difficult problem requiring study and which you are puzzled where to purchase we would be very glad to have you consult us as we have specialized in making or fabricating special machinery or steel framing to meet any requirement.



RAILING FOR CONCRETE STAIRS



SPECIAL STEEL EQUIPMENT



PIPE FRAMES FOR BENCHES AND TABLES

## PRICES

We will be very glad to make up estimate of costs and submit preliminary designs for any special equipment you may require.

## J. H. WAGNER

Engineers and Contractors for  
Air Handling Equipment & Sheet Metal Construction  
191 SPENCER STREET, BROOKLYN, N. Y.

### PRODUCTS

Ventilating Installations, Dust Collecting Systems.  
Drying and Conveying by air, Air separation and  
screening, Fans and blowers.

Sheet metal piping, Smokestacks and breechings,  
Tanks, pans, bins, guards, fireproofing special sheet  
metal utensils, etc.

### DUST COLLECTION AND ODOR ELIMINATION

We will advise on design or construct either cen-  
trifugal, bag or cloth collectors or spray collectors or  
combinations as desirable

### WET PROCESS DUST COLLECTOR

We have developed a water spray collector of max-  
imum simplicity and efficiency in which the spray is  
mechanically maintained at a high intensity. It oc-  
cupies no useful floor space and the capacity in cu. ft.  
of air is high. Particularly adapted for collection of  
fine or impalpable powder.



30" 12-BLADE DISC FAN  
Thrust Bearings Flexibly Mounted



WET PROCESS DUST COLLECTOR  
3 ft. x 3 ft. x 7 ft. Capacity 9000 Cu. Ft. per Min.

### VENTILATION EQUIPMENT

Seventeen years' experience in ventilating problems  
ranging from a telephone booth to a modern hotel  
backs our judgment as to what is theoretically de-  
sirable and what is practically possible. Our knowl-  
edge of what can be done to be effective, of various  
expedients and short cuts is offered to prospective  
clients. 90% of the design of ventilating equipment is  
reconciling apparatus limitations to working condi-  
tions and this knowledge is ordinarily not to be ex-  
pected of Plant Managers. Write us fully as to exist-  
ing conditions with plans or sketch of building and we  
will be glad to advise and arrange for a representative  
to call if practicable.

### AIR SEPARATION

We have been able to effect remarkable economies in  
cleaning materials from foreign substances as well as  
grading or sifting by means of air without the use of  
screens. Send us what data you have with a sample  
of material and quantity per hour to be treated.

# WAILES DOVE-HERMISTON CORPORATION

FORMERLY AMERICAN BITUMASTIC ENAMELS COMPANY

Manufacturers of Anti-Corrosive Paints and Compositions

GENERAL OFFICES

**BITUMASTIC**

17 BATTERY PLACE, NEW YORK, N. Y.

**HERMASTIC**

BRANCH OFFICES

CHICAGO

## PRODUCTS

**BITUMASTIC** and **HERMASTIC** Solutions, Paints, Enamels, Mastics and Special Bituminous Compositions. Protective paints and coatings for iron, steel and concrete exposed to atmospheric moisture, electrolysis, acids, acid fumes, sewage, brine, alkalis, etc., buried in the ground or submerged in fresh, salt or acidulated water.

## BITUMASTIC AND HERMASTIC COMPOSITIONS

These compositions are of a bituminous base from which have been eliminated the ingredients that limit the life and usefulness of ordinary coal tar and asphaltum compounds. The treatment received in manufacture reinforces the preservative properties of the bitumens by exceptional physical properties—i. e., toughness, tenacity, and durability—which are retained throughout a far broader range of temperature and under more severe mechanical distortion and abrasion than have generally been considered to be within the scope of bituminous compositions.

## BITUMASTIC SOLUTION

An anti-corrosive Solution, supplied ready for use, and brushed on cold in the same manner as paint. A black coating that bonds firmly to metal and masonry, and effectually resists the corrosion caused by continuous exposure to the weather, under extremes of heat and cold, corrosive fumes, etc. It will neither chip off nor crack in service. The Solution is a damp-proofing for concrete walls and floors, vat house ceilings, etc. It is extensively used also for the protection of structural steel, condenser coils, cooling towers, boiler fronts and breechings, smoke stacks, bridges, corrugated or sheet metal buildings and roofs, steel window sash, tanks, standpipes, etc.

**Covering Capacity**—On metal surfaces: 300 sq. ft. per gallon one coat; 200 sq. ft. per gallon two coats.

## BITUMASTIC LIQUID PAINTS

Protective paints that possess all the preservative qualities of the basic bitumens while they avoid the uniform black color that has hitherto limited the usefulness of ordinary bituminous paints and compositions.

**Colors**—Made in Red, Brown, Stone and Green.

**Covering Capacity**—Spread easily, and on ordinary structural steel cover at the rate of about 350 square feet per gallon in two coats. Dry quickly, forming a tough, elastic film of full body and attractive surface, with just a pleasing gloss.

**Uses**—Designed for the use of chemists, engineers, architects and industrial executives who must protect their structures against moisture, cement alkalis, and corrosive vapors and fumes. Recommended for:

Steel bridges, buildings and tanks.

Steel framing and sheet steel siding for industrial buildings.

Metal roofs, gutters and eave spoils.

Iron fences, fire escapes and ornamental iron work.

Window sash, ventilators, skylights.

Wrought iron pipe and fittings.

## HERMASTIC ENAMEL

A protective coating against the most severe conditions including moisture, alkalis, salt water, fumes and electrolysis. It will neither crack nor chip during the cold of winter nor run or sag under summer heat. It resists distortion, expansion and other mechanical strains that occur in industrial construction.

**Application**—It is applied hot over a priming coat of Solution which is brushed on cold, and forms an effective and durable coating about  $\frac{1}{16}$ " thick as usually applied. It may be applied either by dipping or brushing. Full printed directions accompany each shipment.

Hermaestic Enamel is chemically inert with respect to most substances; it is impermeable to moisture, clings tenaciously to all surfaces; is ductile and pliable; and is an electrical insulator. The following applications in the chemical industry indicate the diverse uses to which these coatings may be effectively applied:

### Chemical and Dye Plants: Pulp and Paper Mills:

Acid-resisting covering for floors.

Protection of steel exposed to fumes, gases, liquids, and corrosion generally.

Protection of metal structures and vats.

### Soap Factories and Glycerine Refineries:

Protection of buildings, basins, tanks and storage vats.

### Tanneries:

Coating of tanning basins and tanks, pipes and structures.

### Ice Plants:

Protection of brine tanks, ammonia and condenser coils, and circulating pipes in ice reservoirs.

### Gas Works:

Protection of tanks and metal structures from hydrogen sulphide.

### Electrolytic and Leaching Plants for Extraction of Metals:

Protection of structures from sulphurous and arsenic fumes.

### Hydro-electric and Electrochemical Plants for the Treatment of Ores:

Waterproofing and insulation of tanks, apparatus.

### Packing Industries:

Protection against albuminoids, proteids and chlorides.

### Fertilizer, Storage and Manufacturing Plants:

Damp-proofing of structures, coatings for phosphoric acid vats, phosphate treatment, general piping, etc.

### Cold Storage Plants, Dairies, Creameries, Sugar Refineries:

Applied on steel and concrete as a sanitary protection against moisture.

### Mining Works:

Protection of all metallic surfaces from acids.

### Tank Cars:

For the transportation of chemical products.

We shall be glad to consult with Chemists, Engineers and Industrial Executives as to the possibility of our coatings helping to solve their corrosion problems.

# THE WALSH & WEIDNER BOILER COMPANY

Manufacturers of Boilers, Tanks, Structural Steel Work

Factory and General Offices

CHATTANOOGA, TENN.

BRANCH SALES OFFICES

New York

New Orleans

San Francisco

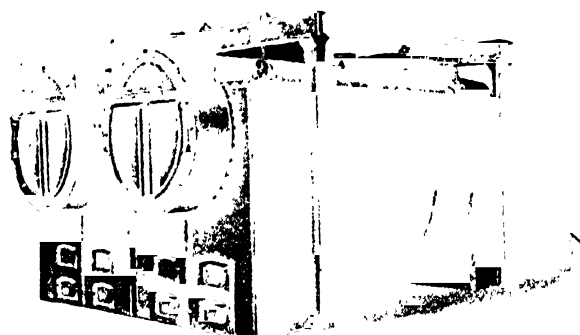
Memphis

Havana

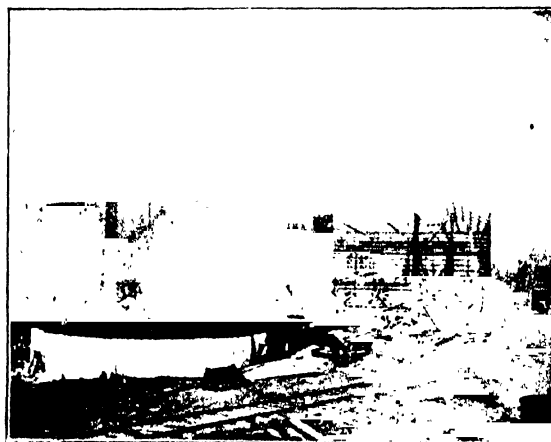
Cuba

## PRODUCTS

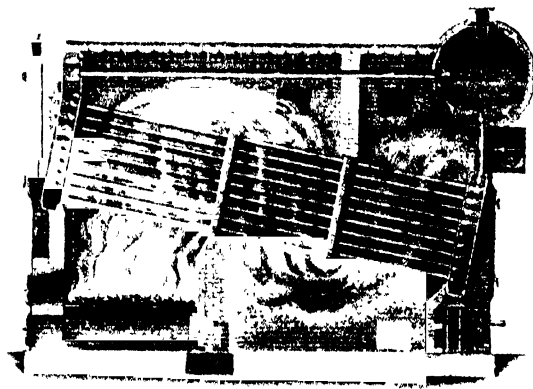
Horizontal Return Tubular Boilers, All Types	
Water Tube Boilers	Gasoline Tanks
Steel Casings for Boilers	Rendering Tanks
Storage Tanks	Agitators
Pressure Tanks	Oil Stills
Acid Tanks	Benzol Washers
Tar Tanks	Gas Coolers
Pneumatic Tanks	Storage Bins
Sulphuric Acid Tanks	Blast Furnaces
Alcohol Tanks	Blast Furnace Stoves
Benzol Tanks	Gas Piping
Ammonia Tanks	Steel Riveted Piping
Molasses Tanks	Towers and Tanks
Sugar House Tanks	Structural Steel Work
Oil Storage Tanks	Standpipes
Sugar Crystallizers	Smokestacks
Scum Tanks	Steel Breechings
Sugar Defecators	Plate Steel Work



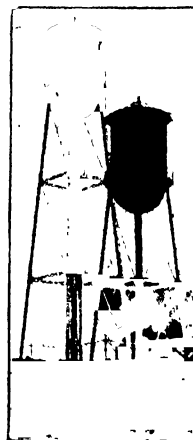
HORIZONTAL RETURN TUBULAR BOILERS IN STEEL CASING SETTING



TAR TANKS AND BUILDING ERECTED BY US IN BY-PRODUCTS PLANT



CROSS DRUM WATER TUBE BOILER  
All Types Manufactured



TOWERS AND TANKS

## SERVICES

We make a specialty of building all kinds of special tanks and plate iron work to suit the requirements of chemical and engineering plants. We furnish and erect complete all tanks, plate iron and structural material for complete chemical plants, blast furnaces, and other industrial plants.

# THEO. C. WALTER, JR.

Copper and Aluminum Apparatus  
13-15 ESSEX STREET, NEWARK, N. J.

## PRODUCTS

Copper and Aluminum Stills: Direct Fire, Coil and Oil or Steam Jacketed.

Columns: Bell or Sieve Construction.

Condensers: both Tubular or Coil Type.

Mixing Kettles

Vacuum Pans

Evaporators

Extractors

Expansion Joints

Jacketed Kettles

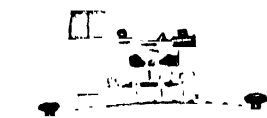
Dye Kettles

Coils: Plain, Lead Covered or Block Tin Lined Lead.

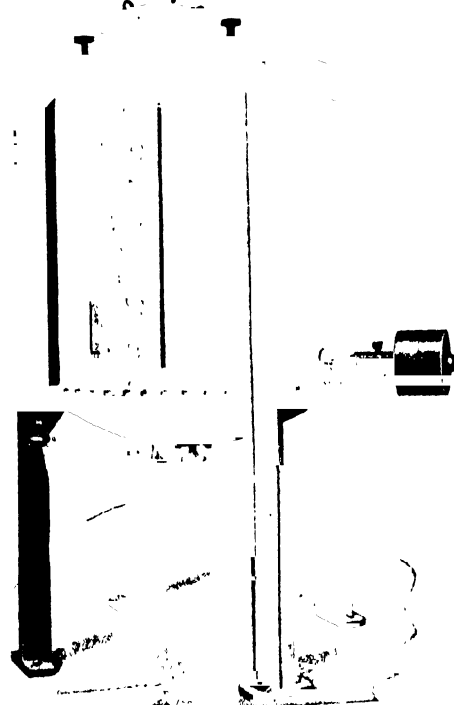
Tin Lined Apparatus.

## ILLUSTRATIONS

The illustrations show special installations of heavy copper work, recently built.



COPPER MIXING TANK, TOP DRIVE



COPPER MIXING TANK, SIDE DRIVE



CONTINUOUS STILL, BELL COLUMN



COPPER WOOD EXTRACTION APPARATUS, ONE OF BATTERY

# O. I. WARING FILLING MACHINE CO.

Patented Filling and Depositing Machinery

59 Fourth Avenue  
NEW YORK, N. Y.

## PRODUCTS

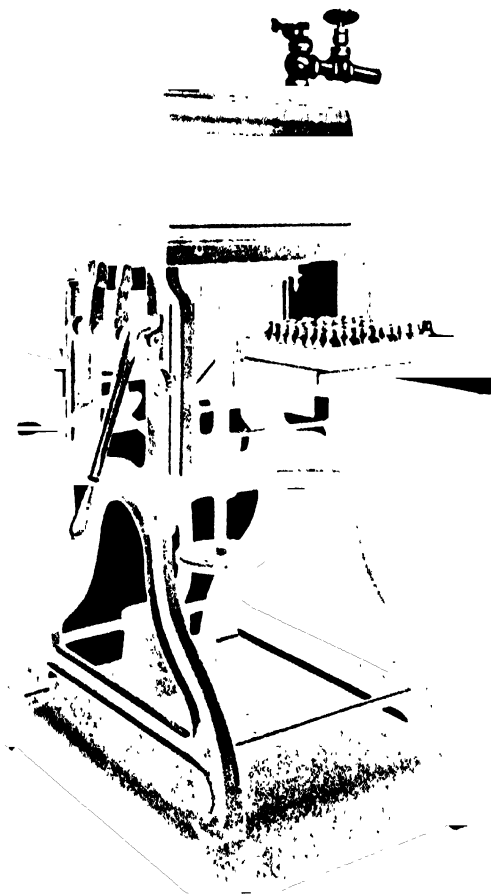
Machines for Filling and Depositing a Wide Variety of Products into any Style of Container; Bottles, Tins, Cans, Paper, etc.

## USES

Our machines are successfully being used by a number of firms for filling liquids, semi-liquids, volatile liquids and viscous products, such as:

Pharmaceuti-	Cold Creams	Waxes
cals	Ointments	Paint
Food Products	Liquid Collo-	Varnish
Syrups	dion	Inks
Candy	Oils and Greases	Shoe Polish
Salves	Specialties	

Products containing suspended materials, such as, Milk of Magnesia, Medicated Ointments, etc.



### SPECIFICATIONS, TYPE B MACHINE

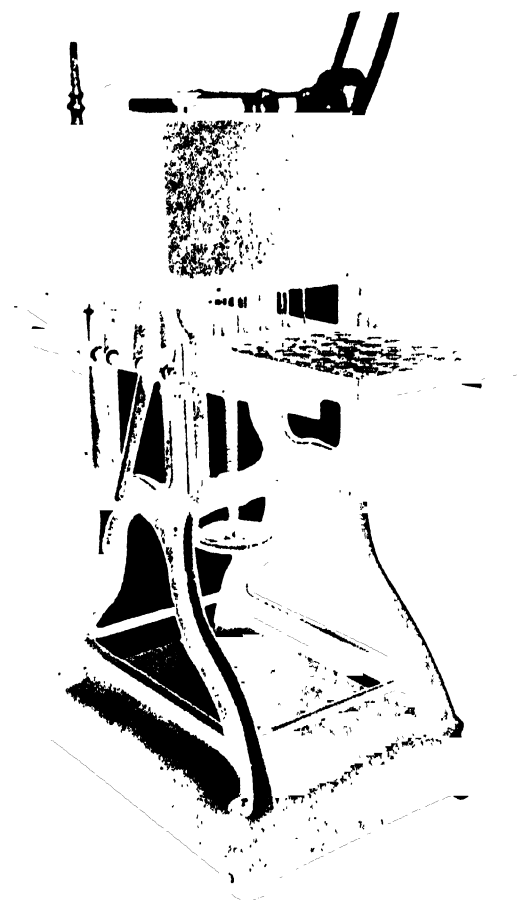
For small bottles, phials, or containers with narrow necks.  
This machine fills up to 100 containers depending on the size, with one single stroke.  
**Capacity**—1 p. to 300 or more containers per minute, depending on size.  
**Height**—5 feet  
**Floor Space**—2 feet by 4 feet  
**Weight**—Approximately 500 pounds

## GENERAL CONSTRUCTION

Sanitary

Initial cost only cost

No repairs, due to the construction, which is the simplest of any filling machine on the market, there being no tubes, springs, washers, pumps and frail parts to get out of order.



### SPECIFICATIONS, TYPE O MACHINE

For depositing Salves, Cold Creams, Waxes, etc.

This machine takes care of all products which must be filled or deposited hot or warm. It is equipped with a double jacketed copper filling reservoir furnished with steam connection. Electric heaters can be used in place of steam.

A mechanical agitating device is also furnished to keep products containing suspended materials well mixed and the temperature uniform throughout.

It fills 24 or more containers with one stroke.

**Capacity**—Up to 240 containers per minute

**Height**—5 feet

**Floor Space**—2 feet by 4 feet

**Weight**—Approximately 500 pounds

Can also be furnished with individual motor

**"Waring for Wearing Qualities."**



# THE WARNER CHEMICAL COMPANY

Manufacturers of the Nelson Electrolytic Chlorine-Caustic Soda Cell  
52 VANDERBILT AVE., NEW YORK, N. Y.

## PRODUCT

The Nelson Electrolytic Cell.

## USE

The Nelson Electrolytic Cell produces Chlorine Gas, liquid Caustic Soda and Hydrogen of the highest purity for any industrial purpose requiring them.

## ADVANTAGES

Low investment, economy of floor space, purity of products, quick shut down or intermittent operating facilities, long life of diaphragms and anodes, no moving parts, everything except electrodes and diaphragms practically indestructible, no appreciable drop in efficiency from year to year, simplicity of construction and operation, minimum labor and power per pound of product.

## GUARANTEE

We are prepared to prove by actual demonstration to those interested, that the Nelson Cell is superior to any other Electrolytic Chlorine-Caustic Soda Cell. Its reliability, uniformity and efficiency, and high quality of products, combined with its low cost of installation, operation and repairs, make it the leader in its field. There are more Nelson Cells installed and producing Chlorine than any other make of cell in the world.

Detailed instructions are given to those who install Nelson Cell plants, which, if followed, will result in much higher efficiencies than those guaranteed. The guarantees have been bettered in every installation made.

## ESTIMATES

We will furnish estimates for a complete installa-

tion giving the cost of producing chlorine. Advise us the amount of chlorine required with the cost of power, salt and labor.

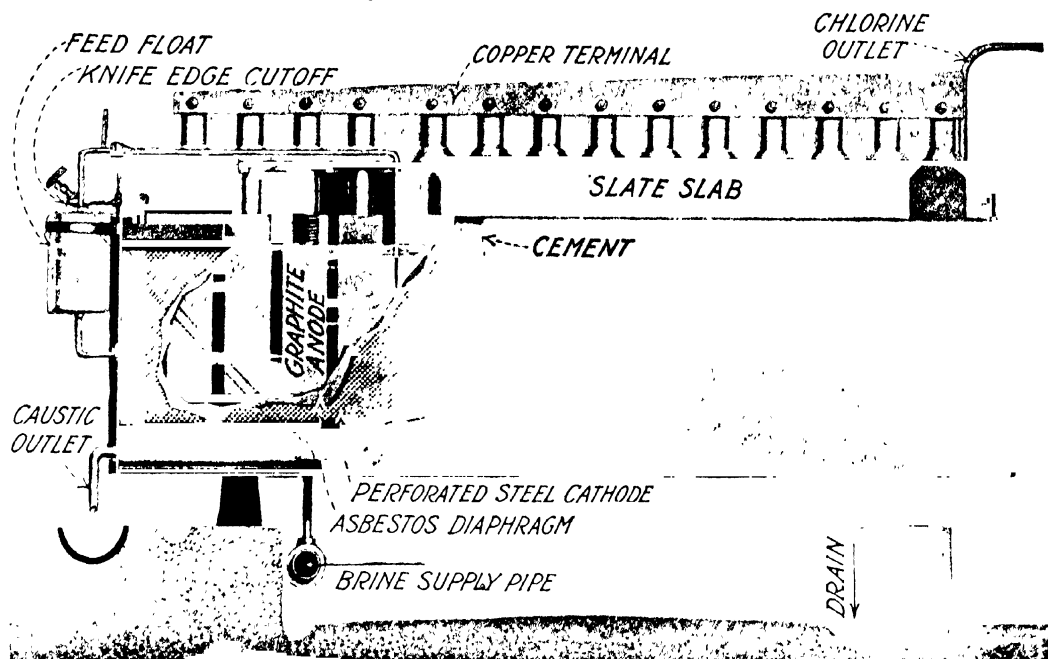
## USERS

Large numbers of Nelson Cells are in use in the United States and abroad in chemical plants, paper mills, oil refineries, detinning and water purification plants, and other industries requiring cheap and reliable chlorine or caustic in quantity.

## INSTALLATIONS

A partial list of our users includes

Baltimore Copper Smelting & Rolling Co.  
Chan To Salt Refining Co., China  
E. I. du Pont de Nemours & Co.  
Fields Point Mfg. Co.  
Gulf Refining Co.  
Hammersley Mfg. Co.  
Howard Smith Paper Mills, Ltd.  
Iggesund Bruk, Sweden  
Kellner-Partington Pulp & Paper Co., Norway  
Kotaro Shunomura, Japan  
Mead Fibre Co.  
Montclair Water Co.  
Mount Morgan Gold Mining Co., Australia  
Nankai Sarashiko, Japan  
Dyson Wood Co., Finland  
Republic Chemical Co.  
Riordon Co., Ltd., Canada  
Roessler & Hasslacher Chemical Co.  
Rollin Chemical Corp.  
Semet-Solvay Co.  
Société Industrielle De Chimiques, S. A.  
Southern Reduction Co.  
Titahgus Paper Mills Co., Ltd., India  
U. S. Government  
Warner-Klipstein Chemical Co.



DETAILS OF NELSON ELECTROLYTIC CELL

# WARREN CHEMICAL DIVISION

T H E I N D U S T R I A L C H E M I C A L C O M P A N Y

Acid and Alkali Resisting Floors, Roofing and Waterproofing

17 Battery Place

NEW YORK, N. Y.

## PRODUCTS

**Acid-proof Anchor Rock Asphalt Floors; Acid-proof Asphalt Filler for brick and tile floors; Acid-proof Paints, Tank Linings, Roofings and Roof Coatings.**

### ACID-PROOF ANCHOR ROCK ASPHALT FLOORS

The economical maintenance of factory floors subject to acid and alkali solutions has long been recognized as a most serious problem.

While many types of floors are more or less acid-resisting and often serve remarkably well under trying conditions, nevertheless the margin of safety decreases with the increasing strength of the acid solutions.

To provide a floor having all the other well-known advantages of rock asphalt mastic, yet immune against the corroding action of the acid and alkali solutions generally used,\* we offer a super acid-resisting grade known as **Acid-proof Anchor Rock Asphalt Mastic**. It is elastic, silent, tough, durable, dustless, non-absorbent, sanitary and waterproof, monolithic—unbroken by joints; affords remarkably sure foothold, can be laid over wooden or cement floors and can be used as soon as it has cooled, usually three or four hours. This eliminates protracted interruptions, so costly in busy plants. Cuts made in Rock Asphalt Floors because of alterations are quickly and easily repaired. The fresh hot mastic bonds perfectly with the old floor, preserving its monolithic character.

### ADAPTABILITY

For bleacheries, chemical laboratories, coke oven plants (saturator houses, sulphate storage rooms, dryer platforms), copper refineries, cyanide gold plants, nickel platers, oil refineries (acid storage rooms), steel mills (metal pickling departments), storage battery rooms, tanneries and morocco plants. Also plants making aniline, caustic soda, drugs, medicines, dyes, explosives, fertilizers, heavy chemicals, paper pulp and soap.

### ACID-PROOF ANCHOR ROCK ASPHALT MASTIC

A super alkali- and acid-resisting combination of natural asphalt and crushed rock tempered with natural asphaltic fluxes to a uniform consistency. When properly mixed with clean, sharp, alkali- and acid-proof sand and grit (see specifications), produces a wearing surface superficially resembling cement, but much superior because of certain desirable qualities above mentioned.

In round cakes weighing about 50 lbs., and branded as per illustration.



CAKE OF ACID-PROOF ANCHOR ROCK ASPHALT MASTIC.

\* All solutions up to 25 to 30% strength. Concentrated solutions so seldom find their way onto floors that the problem of dealing with them seldom arises. For advice in this connection, please communicate with us.

### WARREN'S NO. 1 HARD FLUX

A fluxing agent with a hardening tendency. Used where floors are to be subject to high natural or artificial temperatures. In barrels weighing about 400 lbs. each. Barrels are stenciled "Warren's No. 1 Hard Flux."

### WARREN'S BITUMEN OR SOFT FLUX

A fluxing agent with a softening tendency. Used where floors must remain elastic under reduced temperatures. In barrels weighing about 525 lbs. each. Barrels are stenciled "Warren's Bitumen."

### SPECIFICATION FOR ACID-PROOF ANCHOR ROCK ASPHALT FLOORS

(To follow specifications for concrete or wood foundation): ‡

All grades shall be properly established before the mastic is laid, so that latter shall be of uniform thickness.

By weight, the mixture shall consist of:

	From	To
I Warren's Bitumen or No. 1 Hard Flux	9%	5%
II Acid-proof Anchor Rock Asphalt Mastic §	55%	57%
III Sharp, dry, alkali- and acid-proof sand and grit ¶	36%	38%
	100	100

The Mastic to be brought to the work in the original branded cakes, and the Bitumen, or No. 1, in the original barrels. The sand and grit to be dry, sharp and so graded that the voids shall be reduced to a minimum, no particles to run over ¼ in. in size. The proportions of all ingredients, within the above limits, to be subject to the approval of the engineer.

These materials to be charged into kettles in this order: I, II and III. I and II to be melted before the addition of III. All to be mixed in the usual manner (the kettle temperature at no time to exceed 400° F.), and spread at a temperature of from 325° to 350° F., so that finished floor shall have a uniform thickness of 1½ in. †

After spreading, and as the hot mastic cools and sets, it shall be lightly sprinkled with fine, hard sand and rubbed to a smooth surface finish with the usual smoothing tools or floats.

The engineer reserves the right to reject any bid or bids; and the name of the contractor or subcontractor who is proposed to lay this floor must be submitted to him and receive his approval before the work can proceed.

#### NOTES FOR ENGINEER -

‡ (a) Over wood foundation specify that a sheet of building paper first be laid.

§ (b) Where no special protection against alkalis or acids is important, change to "Anchor Rock Asphalt Mastic."

¶ (c) Where no special protection against acids or alkalis is important, omit the words "alkali- and acid-proof."

\* (d) This can be changed to any thickness between 1 and 2 ins., depending upon traffic expected. 1 in. is sufficient for ordinary foot traffic.

† (e) If finished floor is to be over 1 in. thick, insert here, "Mastic to be laid in 2 layers of equal thickness, breaking joints."

(f) It is usually estimated that 1 sq. ft. of finished floor 1½ ins. thick weighs about 14 lbs., 1 in. thick about 12 lbs. Apply above percentages to ascertain quantities of materials required for any given area.

(g) We recommend that the full text of the specifications be used. If, however, an abbreviated form is desired, we suggest "Floors shall be Warren's Acid-proof § Anchor Rock Asphalt Mastic,\* laid strictly in accordance with the printed specifications revised June 1, 1916, using the materials specified."

### ANCHOR ACID-PROOF PAINT

For protecting brick or concrete walls; also metal surfaces against the action of dilute acids and alkalis. Particularly adaptable for painting storage battery boxes.

# THE WARREN CITY TANK & BOILER COMPANY

Fabricators and Erectors of Steel Tanks and Plate Work

WARREN, OHIO, U. S. A.

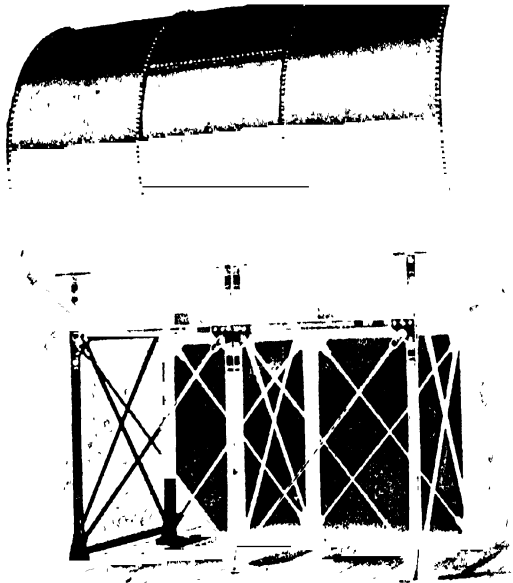
Cable Address: "TANKS" Warren Western Union Code

## PRODUCTS

Steel storage tanks and steel plate work of every description, standpipes, grease kettles, annealing boxes, elevated tanks, smokestacks, riveted pipe, and many other products which have to do with fabrication and plate work.

## TANKS

Any size, any purpose, erected anywhere. Estimates furnished promptly, and assistance given in designing and planning your work.



CYLINDER TANK ON STEEL ELEVATION

## FACILITIES AND ORGANIZATION

The Warren City Tank & Boiler Co. have one of the most modern and up to date plants in the country for handling the class of work mentioned, and the machinery used is of the latest type. This company maintains a large staff of expert engineers and erectors and your difficulties can be solved without any worry to you. Giving satisfactory service for twenty-nine years is evidence that the products turned out by them must be right, and should inspire the utmost confidence.

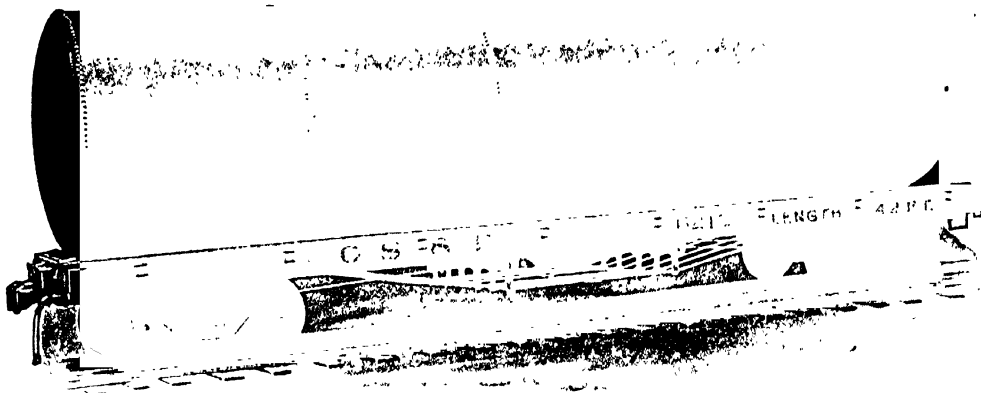
## SCOPE OF MANUFACTURE

The Warren City Tank & Boiler Co. fabricates, builds and erects all kinds of steel tanks, and is prepared to undertake any construction or fabrication involving plate work. It makes a specialty of tanks for the storage of oils, acids, grain, water, molasses, alcohol, and other chemicals, its facilities enabling it to build tanks with capacities varying from 500 to 75,000 barrels (80 to 11,000).

## DELIVERIES, SHIPPING AND PACKING

Large quantities of raw materials are carried in stock at all times, prompt deliveries can ordinarily be made on even the largest orders. Tanks are shipped knocked down, carefully packed, crated and marked so as to prevent damage in transit; this especially applies to foreign shipments.

When circumstances warrant the Company is prepared to do the erecting wherever desired, such work being supervised by expert engineers.



ACID TANK

# WATSON & McDANIEL CO.

## Steam Traps and Steam Controlling Appliances

146 N. 7th Street, PHILADELPHIA, PA.

ESTABLISHED 1878

### PRODUCTS

**Steam Traps; Reducing Valves for steam, water, air and gas; Pressure Regulating Valves; Pump Governors; Relief Valves; Ejectors; Separators for High Pressure and Exhaust steam; Hydraulic Valves; Strainers; Suction Tees.**

#### McDANIEL IMPROVED STEAM TRAPS

Will discharge the condensation without wasting any steam. They have large outlet valves and are not liable to be flooded from sudden flushes of water. The copper floats are made specially heavy and are seamless. The weight of the float holds the outlet valve closed and the valve opens in the direction of the flow of condensation. In this construction we can use heavier floats and larger discharge valves. The Traps are simple in construction and easily taken care of. The water gage on the side shows the proper operation of the traps. They are put together with a few bolts conveniently set in slots. All the working parts are attached to the bonnet which can be removed for repairs without breaking any pipe joints, as these are all connected to the body of the trap. They should be used in all places where condensation will collect, draining steam heating apparatus, steam coils, coil dryers, dry boxes, vacuum pans, kettles, cooking urns, steam tables, paper calendering machines, and similar uses where drying is done by steam. Should also be used on all bleeders from main steam lines and steam separators.



**McDANIEL IMPROVED  
STEAM TRAP**

#### SPECIFICATIONS McDANIEL IMPROVED STEAM TRAP

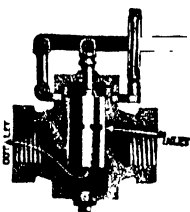
Trap no	Size inlet and outlet standard pipe size	Drainage line in ft. of 1 in. pipe	Drainage sq. ft. of heating surfaces	Capacity lbs. of water per hour 125 lbs. pressure	Price
12	1/2 in.	500	166	1,000	\$12.00
13	3/4 "	1,500	500	3,000	18.00
14	1 "	4,000	1,333	8,000	30.00
15	1 1/4 "	8,000	2,666	16,000	40.00
16	1 1/2 "	15,000	5,000	30,000	60.00
17	2 "	20,000	6,666	40,000	80.00
18	2 1/2 "	25,000	8,333	50,000	100.00

These are suitable for steam pressures up to 125 pounds. Also made extra heavy for 125 to 300 pounds pressure.

#### WATSON REDUCING VALVE

With lever and weight for steam heating or other places requiring low, steady steam pressure.

On a heating system or anything requiring a steady pressure the valve will adjust itself to feed in just enough steam to keep up the pressure wanted. As the valve is controlled entirely by the low pressure side, variations on the boiler will have no effect upon the pressure on the heating system. Also, if a reducing valve should be supplying steam to a building



**WATSON REDUCING VALVE,  
FOR STEAM ONLY**

where, say half of the radiators are in use, and then a few more are turned on, the reducing valve will open wider, so as to let in more steam to supply the increased demand made on the low pressure system, thus insuring a steady pressure on low pressure side at all times. The valve is solid metal throughout all its parts, and there is nothing about it to break or give out just at a time when the valve is most needed.

Made in sizes 1/2 to 6 inches to reduce steam pressures from 150 lbs. or less to any low pressure desired from 1 to 25 lbs. on the outlet.

#### WATSON SINGLE SEAT PILOT REDUCING VALVE

Will reduce steam pressure from 100 lbs. to pressure as low as 2 lbs. if desired and from 200 lbs. to pressure as low as 10 lbs. on the outlet.

Will reduce to any lower pressure as stated and up to 80% of initial or inlet pressure.

This is our latest pattern reducing valve. All parts are renewable and can be replaced with little trouble. This is the best to use for particular places where it is important to have little or no variation in the outlet or low pressure sides. Especially adapted where the consumption of steam is variable, such as steam presses, steam tables, and furniture and tire presses, etc.



**PILOT REDUCING  
VALVE**

#### WATSON AIR AND GAS REDUCING VALVE

Style "B." This valve is made special for use on Air or Gas, and works very accurately, where low pressure is wanted.

For reducing from any initial pressure not above 200 lbs., and to maintain any pressure wanted between 1 and 25 lbs. on the reduced side. Made in sizes 1/2 to 2 inches.

In ordering reducing valves, it is always best to state the high pressure and low pressure wanted on the outlet. We make reducing valves for all purposes.



**AIR AND GAS  
REDUCING VALVE**

#### W. & McD. SYPHON PUMP

Operated with steam pressure for elevating liquids from one level to another; with 60 lbs. of steam it will force 60 feet high.

It is symmetrical in design and small in size, so it can be used in places where saving of space is an object.

It will be found indispensable where tanks are to be pumped out or filled.

It requires no adjustment; simply connect pipes of the proper sizes, and all is ready to work. To start syphon, open steam valve. Made in sizes 1/2 to 3 inches.



**SYPHON PUMP**

# THE WATSON-STILLMAN CO.

Engineers and Builders of Hydraulic Machinery

56 CHURCH ST., NEW YORK, N. Y.

Works at Aldene, Union County, N. J.

SALES OFFICES

Philadelphia Widener Bldg

Chicago McCormack Bldg



## PRODUCTS

High Pressure Hydraulic Pumps, Intensifiers, Cylinders, Valves, Fittings; Hydraulic Presses for Testing, Forming, Forcing, Extruding, Dehydrating, Briquetting, Baling, Cupping and Drawing, and other apparatus for special operations.

## SPECIAL SERVICE

We are constantly designing and building appliances and apparatus for the chemical and allied industries where the requirements are special and only the greatest accuracy is acceptable. Our apparatus is recognized as standard by many leading technical institutions and commercial organizations, as well as by the United States Government. Our experience of over 70 years qualifies us to handle your requirements no matter how exacting.

## HYDRAULIC VALVES AND FITTINGS

Our line embraces an almost endless number of combinations designed to meet the varied requirements of hydraulic systems. Our valves are designed to perform their functions with ease and rapidity, the materials are the best obtainable and each valve or fitting is tested far beyond its listed strength before shipping.



OPERATING VALVE

## HIGH PRESSURE PUMPS

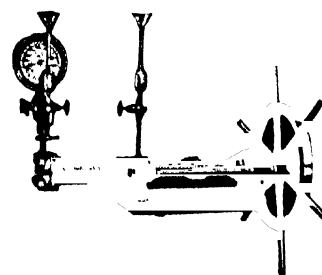
Our line of pumps is so diversified that a standard can be found for practically every power demand. Every piece of material is of the highest grade procurable; the parts are heavy, the bearings are large, the oiling systems are simple and practical. The valves and all working parts are in accessible positions.



HIGH PRESSURE GEARED FOUR-PLUNGER PUMP

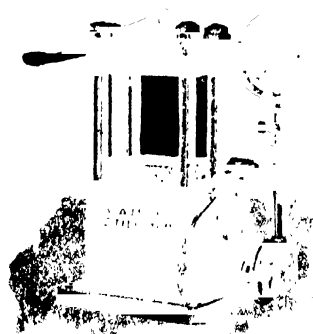
## TESTING MACHINES

We show here a testing machine for subjecting gas containers to an internal hydraulic pressure. We build these in several sizes either hand or power driven. We also build a line of machines for testing tubes and pipe.



STURKE-WATSON STILLMAN TESTING MACHINE

## HYDRAULIC PRESSES



HYDRAULIC LABORATORY PRESS

The press shown here is a small machine for laboratory work. While it is but 27 inches high, it is capable of developing a pressure of 35 tons. We build presses for a variety of purposes — baling, extruding, dehydrating, briquetting, forcing, etc.

## HYDRAULIC ACCUMULATORS

We build accumulators in several types, designed to fill the requirements of location or working conditions. We illustrate here our hydro-pneumatic accumulator, in which air pressure is used to take the place of weights. It is very light for its capacity; can be installed on upper floors and does not need heavy foundations or great headroom.



HYDRO-PNEUMATIC ACCUMULATOR OUTFIT

## COOPERATION

We are ready to quote on your own specifications or design to meet your conditions. Tell us what your problem is and we will give you the benefit of our 70 years' experience.

# THE WEBSTER M'F'G COMPANY

Machinery for Handling Materials and Products

1500-1560 CORTLAND ST., CHICAGO

FACTORIES: Toledo, O., Michigan City, Ind., and Chicago

SALES OFFICES IN PRINCIPAL CITIES

## PRODUCTS

Conveyors, Elevators, Buckets, Chain, Elevator Equipment, Car Hauls, Trippers, Screens, Crushers, Transmission Machinery, Gears, Clutches, Sheaves, Pulleys, Sprockets.

## CONVEYORS

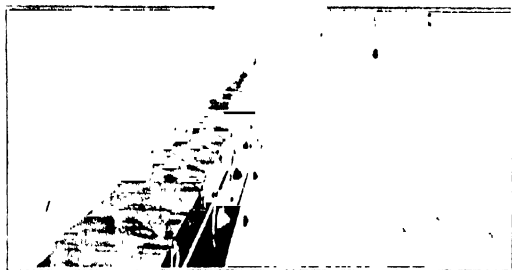
Our line of conveyors is very complete and includes every type of material handling equipment of service to the chemical industry. Space does not permit detailed description of our many types, but we can meet every requirement for equipment of this nature.



SCRAPER CONVEYOR HANDLING AMMONIUM SULPHATE

## PERKINS PIVOTED BUCKET CARRIER

For handling materials under almost all conditions, on either vertical or horizontal runs. Patented roller lip prevents spillage.



PERKINS CARRIER HANDLING HOT CLINKERS

## ELEVATORS

Continuous bucket elevators for handling heavy materials, on either vertical or inclined lift. Each bucket, after emptying, forms a chute for the material from the following bucket. Chain may be either a single strand of combination chain or two strands chain. Bucket elevators of steel bushed roller are designed to meet local conditions.



CONTINUOUS BUCKET ELEVATOR

## BELT CONVEYORS

For other than short distances, the belt conveyor is the type in general use. It is simple and efficient, carrying material in bulk or in packages.



WEBSTER BELT CONVEYOR

## CHAIN

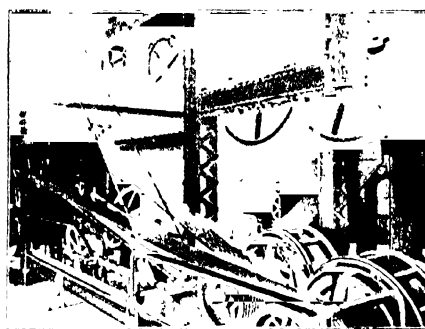
Tested chain for specially severe service; for light drives at ordinary speeds; for apron conveyors; for centrifugal discharge type elevators; for every type of service required by the chemical industry. Detachable link belting is interchangeable with all standard makes of corresponding size. It is suitable for all types of chain elevators.



DETACHABLE LINK BELTING

## TRANSMISSION MACHINERY

Steel plate friction clutch for use as a cut-off coupling for shafts, or as a drive for sheaves, pulleys, sprockets, gears and quills. Friction clutch pulleys; cast iron pulleys; flanged pulleys; steel split pulleys; wood split pulleys; step cone pulleys; rope sheaves; turned iron sheaves.



ROPE TRANSMISSION

## SPROCKETS

All sizes and shapes, with any number and pitch of teeth; solid or split; key-seated or set-screw. Webster sprockets are carefully tested with their respective chain before shipment. Chilled rim sprockets have smooth hard surfaces, with deep chills which make them especially adapted for severe service. Where great strength is required Webster sprockets can be made of cast steel. We can meet any requirement.

OUR HOUSE ORGAN, "WEBSTER METHOD," SENT TO THOSE WHO CAN USE IT.

# WELLER MANUFACTURING CO.

Elevating, Conveying and Power Transmitting Machinery

MAIN OFFICE AND WORKS

1820-1856 NORTH KOSTNER AVE., CHICAGO, ILL.

New York

Boston

Baltimore

BRANCHES

Pittsburgh

Salt Lake City

San Francisco

## PRODUCTS

Coal Crushers, Bucket Elevators, Belt Conveyors, Scraper Conveyors, Apron and Pan Conveyors, Screw Conveyors, Rope Drives, Car Loaders, Car Pullers, Car Unloaders, Power Shovels, Revolving Screens, Shaking Screens, Cement Handling Machinery, Coal Handling Systems, Storage Bins, Automatic Takeups, Bin Gates, Pulleys, Heavy Collar Oiling Bearings, Hangers, Gears, Sprockets, Weller Made Steel Chain.

## WELLER EQUIPMENT

Weller Made equipment is designed, built and sold to do the work it is intended for at a minimum expense for operation and maintenance.

We devise correct Elevating, Conveying and Power Transmitting Machinery to handle any production and gladly offer the service of our engineers to the engineers using catalog, if in any way by advice or suggestion we could be of service to them.

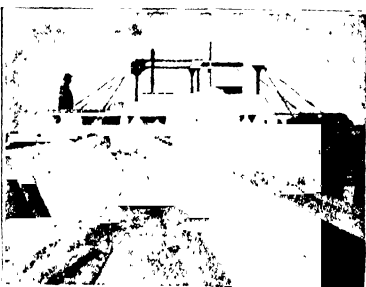
In cement plants, ore grinding, stamp mills, gravel plants, beet sugar factories, also in the large packing plants and terminal elevators Weller Made Machinery is usually specified and preferred.

One of our rigid shop rules is that no piece of machinery shall be shipped out without being set up and



**BELT CONVEYORS**

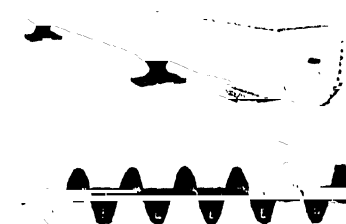
With any size belts desired from 10 inches to 60 inches in width to handle any material from fine powder up to large crusher run stone or ore.



**SHUTTLE TRIPPER FOR BELT CONVEYOR**

This tripper carrying a reversible shuttle belt conveyor 42 inches wide, delivers material from 3 to 25 feet on either side of main belt, which is also 42 inches wide.

We have built these trippers with a spread of 110 feet, thus eliminating heavy bridges for ore bedding and coal storage plants.



**COLD ROLLED SPIRAL CONVEYORS WITH STEEL BOXES**

Regularly made from 4 to 30 inches in diameter

tested. Even a small pulley with set screws is tried on a shaft of the proper diameter before going to the shipping department, wherever several parts are to be fitted and keyed, each piece is tagged, labeled or otherwise marked to identify it on the job.

By following the above rule delays and trouble at the time of installing are overcome and the man on the job can depend on each piece fitting properly and giving the service that is required of it.

Write. Let us know the equipment you are interested in. Literature will be sent.

## ONE, TWO AND FOUR ROLL CRUSHERS

Operate at slow speeds, crack instead of breaking, the coal thereby producing less fine dust.



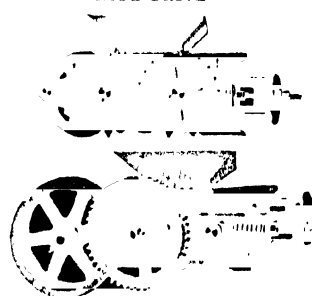
**SELF CONTAINED APRON CONVEYOR FEEDERS**

Especially adapted for fitting to bottom of track hoppers and feeding materials to crushers, elevators or conveyors.

In order to secure a uniform flow from the track hopper to the conveyor it is necessary to use a mechanical feeder. In this way, the flow may be so regulated that the carrier will always operate at its maximum capacity. The result may be secured regardless of lump material or the amount of material in the hopper.



**HEAVY LINE SHAFT EQUIPMENT AND ROPE DRIVE**



**COAL CRUSHERS**  
Simple Heavy Powerful

## WELLER MADE STEEL CHAIN

Will last as long and give as good service as any chain made. A chain to meet your requirements. Write for price list.



**THIS STAMP ON STEEL CHAIN INSURES SERVICE**

# WERNER & PFLEIDERER COMPANY

Machinery and Appliances Used in the Chemical,  
Pharmaceutical, Food and Allied Industries



GENERAL OFFICES  
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SOLE SALES AGENTS

JOSEPH BAKER SONS & PERKINS COMPANY, INC.  
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FACTORIES  
Saginaw, Mich.

## PRODUCTS

"Universal" Kneading and Mixing Machines for all purposes; Automatic Sifting, Blending, Conveying and Weighing Plants for Flour, Powdered Sugar, Carbon Flour and materials of similar consistency; Baking and Drying Ovens; Hydraulic and Screw Presses for extrusion of plastic masses, etc.; Rapid Dissolvers for China Clay, Kaolin, Salts, etc.; Rubber Cement, Compounding, Masticating and Washing Machines; Vacuum Mixing Machines; Complete installations for the manufacture of Bread, Biscuit and Wafers, Macaroni, Noodles, Chocolate and Candy, Automatic Traveling Ovens.

## "UNIVERSAL" KNEADING AND MIXING MACHINES

"Universal" Kneading and Mixing Machines are built in a large variety of sizes, in a number of types and in different classes of strength. Working capacities range from  $\frac{1}{4}$  gallon up to 2650 gallons.

The unlimited adaptability of "Universal" Kneading and Mixing Machines has brought us into intimate contact with a great variety of different industries, and the experience of long years gained by solving the problems of such industries enables us to determine the particular type and class of machine most suitable for a specific purpose. By giving us complete data and answering the following questions you will help us considerably in quoting or advising you intelligently on the machine suitable for your purpose.

- (1) What are the materials to be treated and what is their nature, form, consistency, etc.?
- (2) What is their specific gravity and what is the weight of the mass per gallon or cubic foot?
- (3) How many pounds, gallons or cubic feet of material do you want to treat in one operation?
- (4) If cast iron and steel are subject to corrosion on the part of your material, what metals or other materials have in your experience withstood such corrosive action?
- (5) Is the mass to be kept at a certain temperature during the mixing process?
- (6) Do you use volatile solvents which are to be recovered and do you wish to avoid dusting or the escape of injurious gases or fumes?

## EXPERIMENTAL SERVICE

If the materials to be treated are new to us and you desire a test to more fully convince yourself of the entire suitability of our machine to your requirements, arrangements can be made to ship the ingredients to our factory for ample tests.

Should you prefer to conduct the experiments at your plant, we are ready to arrange for sending a suitable machine of small capacity, on trial for a reason-

able length of time, and on conditions involving a very slight expenditure in any case, and no expense on account of the experiments in the event the machine is retained, or another size or type purchased in its stead.

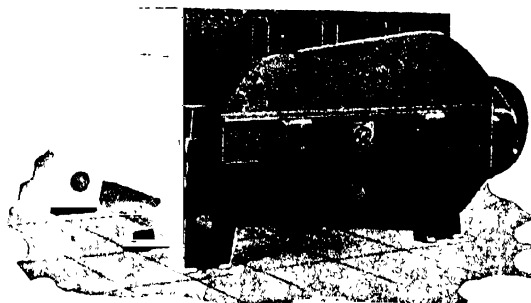


SIZE 6, TYPE I II, CLASS BS, LABORATORY SIZE  
Working Position

**Drive**—The Standard Driving Arrangement of our "Universal" Kneading and Mixing Machines, except Type I II Laboratory Sizes, is our improved three-pulley drive, by means of which the action of the mixing blades can be reversed at will. The reversing action greatly accelerates the kneading and mixing process and facilitates the discharge of the finished mass. Our machines can also be furnished for direct motor drive, if so desired.

**Heating and Cooling Arrangement**—All "Universal" Kneading and Mixing Machines can be furnished with Heating and Cooling Jackets. On larger sizes heatable mixing blades can be supplied.

**Covers**—All "Universal" Kneading and Mixing Machines can be provided with covers to suit individual requirements.



SIZE 30, TYPE X, CLASS BB NON-TILTING, JACKETED MIXER  
With Liquid-tight Discharge Valves; Working Capacity 2650 Gallons

*Continued on Next Page*



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Elevating, Conveying and Power Transmitting Machinery

MAIN OFFICE AND WORKS

1820-1856 NORTH KOSTNER AVE., CHICAGO, ILL.

New York

Boston

Baltimore

BRANCHES

Pittsburgh

Salt Lake City

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## PRODUCTS

Coal Crushers, Bucket Elevators, Belt Conveyors, Scraper Conveyors, Apron and Pan Conveyors, Screw Conveyors, Rope Drives, Car Loaders, Car Pullers, Car Unloaders, Power Shovels, Revolving Screens, Shaking Screens, Cement Handling Machinery, Coal Handling Systems, Storage Bins, Automatic Takeups, Bin Gates, Pulleys, Heavy Collar Oiling Bearings, Hangers, Gears, Sprockets, Weller Made Steel Chain.

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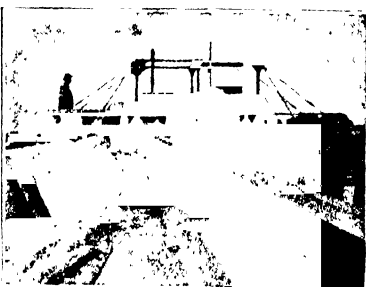
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**BELT CONVEYORS**

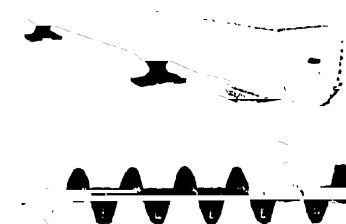
With any size belts desired from 10 inches to 60 inches in width to handle any material from fine powder up to large crusher run stone or ore.



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Regularly made from 4 to 30 inches in diameter

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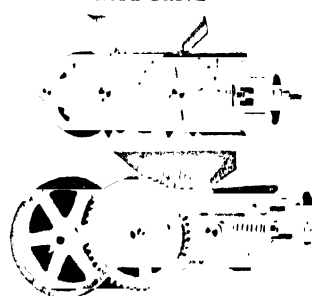
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# WESTERN ELECTRIC COMPANY

Equipment for Every Electrical Need

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## PRODUCTS

The Western Electric Company is prepared to furnish equipment for every electrical need in the chemical industries.

This equipment includes such items as alternating and direct current motors; safety enclosed starting switches; ventilating outfits; intercommunicating telephones; iron-box telephones; flood lamps and wiring supplies of every description.

The name Western Electric guarantees the high quality of each item.

## SERVICE

Our 48 well-stocked Distributing Houses in the principal industrial centers of the country are in an exceptional position to render prompt service in shipping electrical equipment. A service staff at each House is prepared to aid in the selection of the proper equipment for any desired purpose. We are especially equipped to give emergency service.

## MOTORS

For general power service, there are A. C. and D. C. motors of rugged construction to meet any requirement.

Windings can be specially treated for conditions prevailing in chemical plants, at slightly additional expense.

The available sizes range from 1/50 H. P. up, horizontal or vertical types. They are especially adapted for service on centrifugals, pumps, compressors and other plant or laboratory equipment.



TYPE RC MOTOR



TYPE K  
CONSTANT  
SPEED INDUCTION  
MOTOR

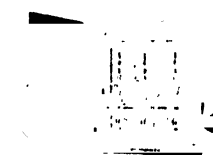
## SQUARE "D" SAFETY SWITCHES

The use of these switches is a safeguard for men and machinery against accidents that are common with the obsolete open knife switch.

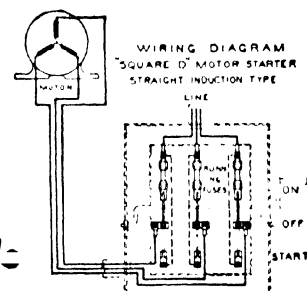
Square "D" Steel Enclosed Motor Starting Switches are designed for use with all types of motors and for electric light circuits.



MOTOR STARTING  
ENCLOSED SWITCH



MOTOR STARTING  
SWITCH, DOOR OPEN



WIRING DIAGRAM  
"SQUARE D" MOTOR STARTER  
STRAIGHT INDUCTION TYPE

WIRING DIAGRAM, SQUARE  
"D" MOTOR STARTER,  
STRAIGHT INDUCTION TYPE

## VENTILATING OUTFITS

Western Electric Ventura and Davidson Ventilating Outfits are ideal for exhausting steam, moist air and noxious or odorous fumes and gases. Each outfit is a rugged unit combination of fan, motor and tripod.

The outfits are designed for free intake and delivery. Ventilating outfits for duct work requiring special engineering, can be taken up with our engineers.



WESTERN ELECTRIC-DAVIDSON  
VENTILATING FAN



WESTERN ELECTRIC  
VENTURA FAN

*Continued on Next Page*

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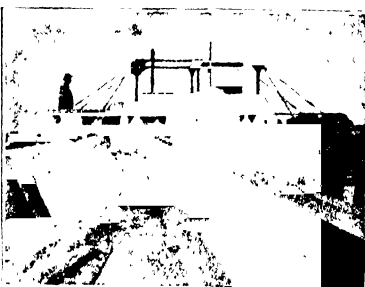
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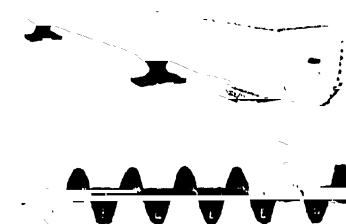
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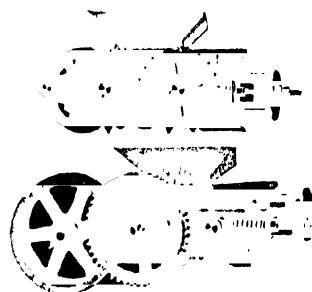
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**France**—Her colonies and dependencies Compagnie Electro Mechanique, 12 Rue Portalis Paris France  
**Great Britain**—Her colonies dependencies and protectorates other than in North America Metropolitan Vickers Electrical Export Company, Ltd., 4 Central Buildings, Westminster, S. W. 1 London, England

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**Peru**—Emilio Wagner y Cia, Lima, Peru  
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### \* Catalogue of Electrical Supplies

Numbers of descriptive leaflets and application circulars will be found listed with various apparatus to which they pertain

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Blowers	See Fans . . . . . 955	Heaters, Air	See Heating Appliances . . . . .	Panels, Switchboard	See * . . . . . 960
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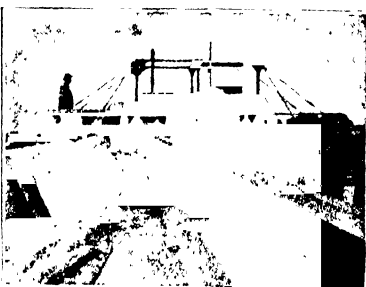
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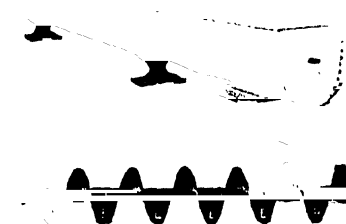
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We have built these trippers with a spread of 110 feet, thus eliminating heavy bridges for ore bedding and coal storage plants.



**COLD ROLLED SPIRAL CONVEYORS WITH STEEL BOXES**

Regularly made from 4 to 30 inches in diameter

tested. Even a small pulley with set screws is tried on a shaft of the proper diameter before going to the shipping department, wherever several parts are to be fitted and keyed, each piece is tagged, labeled or otherwise marked to identify it on the job.

By following the above rule delays and trouble at the time of installing are overcome and the man on the job can depend on each piece fitting properly and giving the service that is required of it.

Write. Let us know the equipment you are interested in. Literature will be sent.

## ONE, TWO AND FOUR ROLL CRUSHERS

Operate at slow speeds, crack instead of breaking, the coal thereby producing less fine dust.



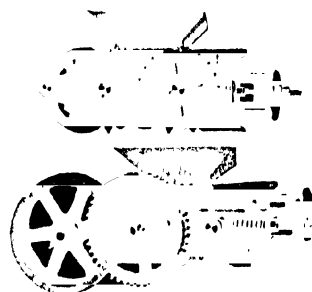
**SELF CONTAINED APRON CONVEYOR FEEDERS**

Especially adapted for fitting to bottom of track hoppers and feeding materials to crushers, elevators or conveyors.

In order to secure a uniform flow from the track hopper to the conveyor it is necessary to use a mechanical feeder. In this way, the flow may be so regulated that the carrier will always operate at its maximum capacity. The result may be secured regardless of lump material or the amount of material in the hopper.



**HEAVY LINE SHAFT EQUIPMENT AND ROPE DRIVE**



**COAL CRUSHERS**  
Simple Heavy Powerful

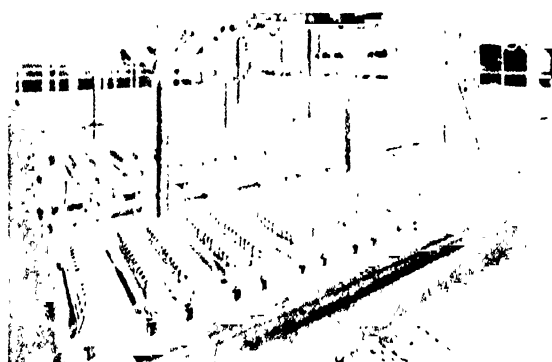
## WELLER MADE STEEL CHAIN

Will last as long and give as good service as any chain made. A chain to meet your requirements. Write for price list.



**THIS STAMP ON STEEL CHAIN INSURES SERVICE**

**Heavy Acids and Alkalis**—In a plant manufacturing on a large scale such substances as sulphuric acid, soda ash, alum, etc., the uses for electrical equipment are many and varied. Among Westinghouse products will be found motors specially adapted to this class of plant. In these motors special precautions have been taken to enable them to stand up against the deteriorating action of acids and other fumes, dust, grit, extremes of temperature and other conditions. These motors (which are fully described on pages 953 to 955) include types suitable for driving conveyors, crushers, rotary furnaces, blowers, pumps, mixers, agitators, etc.



CELL ROOM SHOWING SIX TANKS OF 74 CELLS EACH  
U. S. Government Chlorine Caustic Soda Plant, Edgewood Arsenal, Md.

In the largest alkali plants motors are extensively used for mixers, agitators, centrifugals, filters, crushers, coke pushers, blowers, gas boosters, cableways, conveyors, cranes, locomotives, coal and ash conveyors, automatic stokers, barrel and drum factories, and lime, by-product, and water pumps.

According to one of the leading sulphuric acid engineers the chief direction in which we may look for an increase in the efficiency of acid plants is in the mechanical handling of materials and for this purpose Westinghouse supplies electrical haulage equipment, as well as special motors suitable for all types of cranes, unloading equipment, and conveyors.



16 H.P. TYPE CS MOTOR (ON LEFT) DIRECT CONNECTED TO WATER CIRCULATING PUMP, AND 6 H.P. CS MOTOR (ON THE RIGHT) BELTED TO PRE-HEATER PUMP  
Plant of Iso Chemical Co., Niagara Falls, N. Y.

**Fertilizers and Phosphate Mining**—Much of what has been said under the preceding heading will also ap-

ply to this important industry, since a large proportion of all sulphuric acid is used in the manufacture of phosphate fertilizers. Further applications of electric power are made in connection with the actual mining of rock phosphate as for driving shovels, grinding machines, crushers, pumps, washers and for furnishing transportation. Comparisons prove that an electrically operated car requiring only one man can do the work of from four to eight men, depending on local conditions.

**By-Product Coke Industry**—A by-product coke plant may be considered as being divided into four sections in which the operating conditions and electrical apparatus required differ materially. These sections are: (1) Coal handling, (2) Coke-ovens, (3) Coke handling, (4) By-product plant.

When used for coal handling, motors are subjected to dust of an explosive nature, but not especially detrimental to the insulation. The principal motor applications in this service are crushers, hammer mills, and conveyors for which alternating current motors of both squirrel cage and wound-rotor types are suitable. The motors are totally enclosed and the larger ones are designed to receive a supply of clean air, either by means of forced or self-ventilation.

The electrical apparatus of the coke ovens themselves is not subject to so dirty an atmosphere as in the handling of coal and coke, but the service required of the motors and control is quite severe, many of the motors being mounted on moving machinery, such as lorry cars, pushers, and door machines. Other applications consist of reversing machines, gas cocks, clay mixers, clay elevators, and quenching pumps. Due to the load characteristics of the first group of applications most of the motors used are of the direct current type.

In handling coke, motor conditions are similar to those in handling coal, but are more severe. Electric locomotives are used along the ovens for hauling the coke to the quenching station and also for moving the coke cars about the plant.

In the by-product plant, the motor applications are to a large extent for various types of pumps, although there are also mixers, crushers, centrifugals, gas boosters or blowers, and fans. All of these applications (with the exception of the booster) are suitable for the use of alternating current squirrel cage motors. The booster requires the use of a variable speed, direct current motor.

Westinghouse has been in close touch with the by-product coke industry, since its first development in this country, and in this way, has been able to introduce many improvements in the design and application of electrical equipment.

**Explosives, Dyestuffs and Synthetic Chemicals**—The equipment used for the manufacture of explosives, dyestuffs and synthetic pharmaceutical and other chemicals is very similar in general nature—so much so that a dyestuff plant can almost immediately be converted into an explosive plant, which was one of the reasons why the German Government valued so highly their dyestuff industry.

Motors are used throughout such plants for driving the various machines, such as nitrators, autoclaves, centrifugals, rotary driers, tank agitators, etc. Each machine is usually driven by its own motor, belting and gearing being very objectionable in such plants. The drive is usually chain or direct connected. Here

*Continued on Next Page*

# WELLER MANUFACTURING CO.

Elevating, Conveying and Power Transmitting Machinery

MAIN OFFICE AND WORKS

1820-1856 NORTH KOSTNER AVE., CHICAGO, ILL.

New York

Boston

Baltimore

BRANCHES

Pittsburgh

Salt Lake City

San Francisco

## PRODUCTS

Coal Crushers, Bucket Elevators, Belt Conveyors, Scraper Conveyors, Apron and Pan Conveyors, Screw Conveyors, Rope Drives, Car Loaders, Car Pullers, Car Unloaders, Power Shovels, Revolving Screens, Shaking Screens, Cement Handling Machinery, Coal Handling Systems, Storage Bins, Automatic Takeups, Bin Gates, Pulleys, Heavy Collar Oiling Bearings, Hangers, Gears, Sprockets, Weller Made Steel Chain.

## WELLER EQUIPMENT

Weller Made equipment is designed, built and sold to do the work it is intended for at a minimum expense for operation and maintenance.

We devise correct Elevating, Conveying and Power Transmitting Machinery to handle any production and gladly offer the service of our engineers to the engineers using catalog, if in any way by advice or suggestion we could be of service to them.

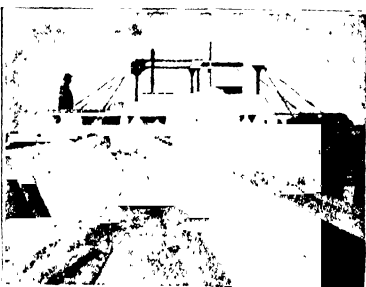
In cement plants, ore grinding, stamp mills, gravel plants, beet sugar factories, also in the large packing plants and terminal elevators Weller Made Machinery is usually specified and preferred.

One of our rigid shop rules is that no piece of machinery shall be shipped out without being set up and



**BELT CONVEYORS**

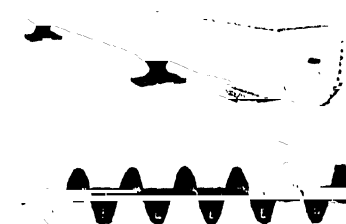
With any size belts desired from 10 inches to 60 inches in width to handle any material from fine powder up to large crusher run stone or ore.



**SHUTTLE TRIPPER FOR BELT CONVEYOR**

This tripper carrying a reversible shuttle belt conveyor 42 inches wide, delivers material from 3 to 25 feet on either side of main belt, which is also 42 inches wide.

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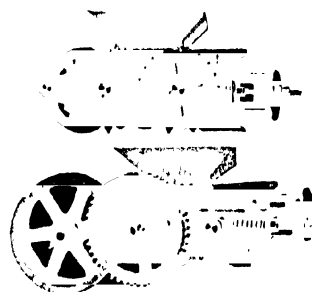
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**HEAVY LINE SHAFT EQUIPMENT AND ROPE DRIVE**



**COAL CRUSHERS**  
Simple Heavy Powerful

**WELLER MADE STEEL CHAIN**

Will last as long and give as good service as any chain made. A chain to meet your requirements. Write for price list.



**THIS STAMP ON STEEL CHAIN INSURES SERVICE**

tion involves the following: (1) A source of low voltage alternating current, (2) A transformer, (3) A high-voltage rectifier, (4) Means for driving the rectifier, (5) A switchboard and accessories. With the exception of the rectifier all of this equipment is of standard design.



**SIX 25KVA 100,000 VOLT ELECTRICAL PRECIPITATION UNITS**  
St. Joseph Lead Co.

There are three different systems of arranging electrical apparatus.

Each system has its own field of usefulness but the selection of any one of them requires careful analysis of local conditions, power supply, and arrangement of treaters.

The electrical apparatus for some of the earliest commercial treaters was supplied by Westinghouse, and this company has equipped many of the installations now in operation. Special attention is directed to the fact that this line of Westinghouse equipment, though highly specialized in itself, has been thoroughly standardized, and that standard sizes of generators, transformers, etc., can be obtained—C-7176.



**FOUR 700-H.P. TYPE CW MOTORS DRIVING PROCESS PUMPS**  
United States Government Nitrate Plant No. 2, Muscle Shoals, Ala.

#### NITROGEN FIXATION

No matter what process is considered for the fixation of nitrogen, electricity plays an important part. If ni-

tric acid is produced from the air by means of an arc furnace, the power consumption runs into hundreds of thousands of electrical horse-power. If the cyanamid process is employed it involves the use of electric furnaces for heating calcium carbide with nitrogen with which it combines for forming calcium cyanamid, and these furnaces require enormous amounts of power necessitating large installations of generating equipment, transformers and switchboards. The crushing machinery, blowers, etc., are electrically driven, as are also the compressors for producing the liquid air and ammonia.

#### ELECTROLYTIC PROCESSES

Direct current is required in all electrolytic processes, either synchronous rotary converters or motor-generators being used to obtain this form of energy from alternating current supply circuits.

Rotary converters commend themselves for this work on account of their high efficiency. A complete line of commutating-pole rotary converters was developed for this service by Westinghouse. They are unequalled for simplicity, ruggedness, compactness, and large capacity within a minimum floor space.

Over one and one-half million kilo-watts of rotary converter capacity under widely varying conditions affords abundant evidence of their success.

As most electrolytic processes require a certain voltage range to maintain a constant current on the cells, synchronous booster-type converters are used very extensively. The Westinghouse synchronous booster consists of a shunt-wound in combination with an alternating current generator mounted on the same shaft with, and having the same number of poles as, the converter. By varying the field excitation of the generator, the voltage impressed on the converter itself can be increased as desired, and the direct current voltage obtained from the converter is thereby varied accordingly.



**NINE 2500-KW. SYNCHRONOUS BOOSTER CONVERTERS FURNISHING DIRECT-CURRENT FOR THE PRODUCTION OF ALUMINUM**

There are 18 Westinghouse rotaries of a similar rating installed in this plant. The illustration also shows a portion of the 10,000 ampere and 20,000 ampere Westinghouse carbon circuit breakers for the control of the D.C. side of the rotaries.

#### BOOSTER CONVERTERS FOR ELECTROLYTIC WORK

Below is given a partial list of standard ratings of Westinghouse synchronous booster rotary converters for electrolytic work. These machines are rated to carry full load current continuously over the entire range of voltage at a temperature rise not to exceed 50° C.

*Continued on Next Page*



60 CYCLES				
kW	Amperes	Normal Voltage	Voltage Range	Rev. per min.
500	2000	250	220-280	1200
1000	4000	250	220-280	900
1500	6000	250	220-280	600
2000	8000	250	220-280	400
3000	14000	250	220-280	275

25 CYCLES				
kW	Amperes	Normal Voltage	Voltage Range	Rev. per min.
500	2000	250	220-280	700
750	3000	250	220-280	700
1250	5000	250	220-280	500
1875	7500	250	220-280	500
2000	8000	250	220-280	500

Where the voltage range is greater than that shown in the table, it may be readily secured by providing the transformers with more than one operating voltage tap, and installing the necessary switching equipment to change from one to the other.

**Motor-Generators**— Sometimes motor generators are used in place of rotary converters for converting alternating into direct current for electrolytic work. Westinghouse motor-generators exhibit ability to withstand heavy overloads and their ruggedness, economy and reliability have proved highly successful when rotary converters are not used.

#### ELECTROMETALLURGICAL INDUSTRIES

**Electric Steel**— During the last ten years the electric furnace has been used increasingly in the steel industry, principally in refining alloy steels. Recently its use has been extended to refining common steel, malleable iron, etc. The modern electric furnace differs greatly from older types; operating costs have been lowered by larger sizes, improved devices for charging and tilting, larger electrodes and automatic regulation.

Steel refining furnaces are now built in sizes from  $\frac{1}{2}$  to 30 tons. The 1 to 10 ton sizes are common. In the following table are given the sizes of furnace transformers, winch and tilting motors used with the average steel refining furnace of to-day.

SIZES OF FURNACE TRANSFORMERS AND MOTORS

Furnace Tons	Transformers KVA	H. P. of Motors	
		Winch	Tilting
1	500	2	14
2	800	2	14
3	1000	2	14
6	1500	3	25
10	2400	5	35



THREE 6-TON HEROULT FURNACES

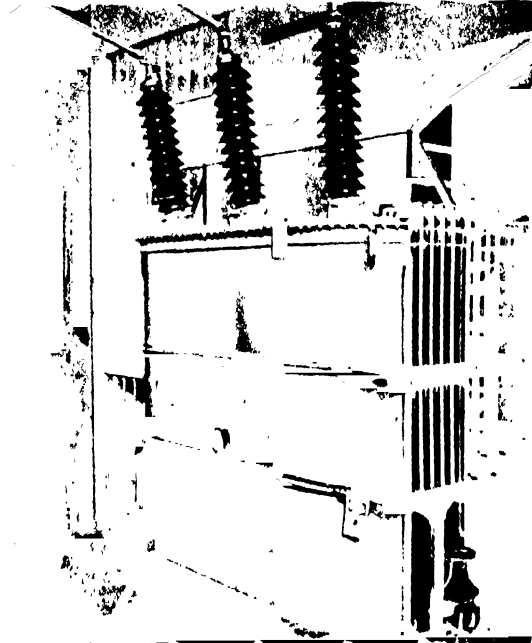
Installed in the Anniston Steel Co., Anniston, Alabama.

Westinghouse is a pioneer in the electric furnace field, and its engineers have not only worked in close cooperation with the furnace manufacturers and users, but have carried on extensive research and development work independently. Such questions as reactance, skin effect, and method of interlacing low voltage bus-bars, have been fully investigated and analyzed, and a large measure of the success of these installations is due to this work.

The line of equipment supplied is complete, consisting of furnace transformers for reducing the line voltage to that suitable for the furnace, automatic voltage

regulators, tilting and winch motors, automatic electrode regulators and switchboards. Ruggedness, simplicity and dependability are essential and have been incorporated in the apparatus. Those parts requiring refinement and precision are accurately designed and carefully constructed. The result is an equipment with the individual pieces of apparatus properly designed for the service they are to perform.

Standard equipment for electric steel melting, ferro-alloy and refining furnaces is described briefly immediately hereafter. Westinghouse is also prepared to furnish complete equipment and accessories for brass furnaces.



3 PHASE O I W O TRANSFORMER

**Furnace Transformers**— The standard Westinghouse Transformers for furnace operation are of the well known shell type, oil insulated, and are either self-cooled or water-cooled. They are compact, rugged, and capable of withstanding the heavy surges and stresses incident to furnace operations. Spacing strips between the coils insure thorough distribution of oil and proper cooling, thus eliminating the danger of hot spots. Special attention is paid to bracing the coils, both inside and outside the iron circuits, to prevent any distortion of the coils in case of sudden fluctuations in current, or short circuits. This is important as a slight distortion may injure the insulation with resultant breakdown and interruption of power supply. Transformers for furnace work are designed for normal reactance unless otherwise specified, and all coils are interlaced and the leads brought out through the terminals for receiving flexible leads from the furnace.

3,000 KVA O I S C 11,000-100 VOLT, 3-PHASE, ELECTRIC FURNACE TRANSFORMER

Provided with delta connections at terminals for receiving flexible leads from the furnace.

Continued on Next Page

case interlaced in order to reduce the reactance. The low tension side is provided with heavy copper bus leads which are carried from the coils directly through the cover and arranged for connection to the furnace bus. Transformers are supplied for all commercial currents and frequencies, and for any low voltage required.

**Reactance.** Usually a furnace installation is arranged so the reactance will be as low as possible in order to get full power into the furnace. In some cases, however, additional reactance is necessary to relieve the demand on the power supply system. Westinghouse can furnish reactors of either the air cooled or oil immersed type for any amount of reactance.

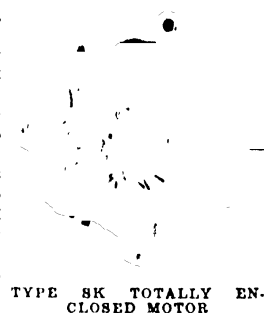
**Electrode or Winch Motors.** All furnaces with movable electrodes require a raising and lowering mechanism. Usually a motor driven winch is used. Current is supplied to the furnace at constant voltage. As the electrodes are consumed, the current would vary if the position of the electrodes with respect to the metal bath were not adjusted. For accomplishing this D. C. motors operating the winch are used, mounted directly on the furnace. The standard Westinghouse winch motor is a 230 volt shunt wound type, rated at 55° C. for one hour. It is totally enclosed to protect the windings from dirt and mechanical injury. When the motor is tilted with the furnace proper lubrication is furnished by self lubricating bearings. One motor is supplied for each movable electrode. If direct current is not available, a small motor generator ranging from 3 to 16 kw. may be supplied.

**Tilting Motors.** For tilting the furnace, either A. C. or D. C. motors may be used. For use with alternating current the standard Westinghouse tilting motor is recommended. This motor is ruggedly built, bearings of ample proportions, well lubricated, and protected from dirt, shaft of large diameter, enabling motor to handle the sudden strains when tilting the furnace.

A magnetic brake is furnished to secure a quick and accurate stop when tilting. The brake can be depended on to hold the furnace at any desired point. Should the regular adjustment of the brake shoes be neglected or the power supply suddenly fail, there is no danger of the brake failing to hold the load, as strong compression springs apply the brake shoes and they will not release until the necessary adjustment is made or the power returns, as the case may be. The standard type reversing drum controller with suitable resistor is used for operating the tilting motor.

Where direct current is used for tilting, the standard 230 volt series wound Westinghouse motor is recommended. This motor is enclosed, has a high starting torque and combines such special features as compactness, reliability, simplicity and ease of inspection and repair. A removable cover over the commutator permits easy access for brush attention. A self-contained brake having no exposed moving parts is used. It is operated automatically by means of the motor controller.

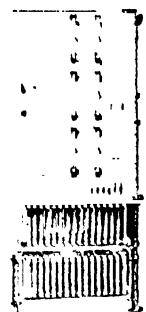
**Automatic Regulation.** Westinghouse has devised a regulator which will fully meet conditions. Realizing the limitations of existing types of regulators actuated by change in current only, the new Westinghouse regulator is designed on an entirely new principle employing both voltage and a current coil. It can be used with any furnace having movable electrodes. The



TYPE 8K TOTALLY ENCLOSED MOTOR



TYPE CI TILTING MOTOR



WESTINGHOUSE ARC FURNACE REGULATOR  
With Control Elements, Contactor, Switches, etc.



ARC FURNACE REGULATOR CONTROL PANEL

WESTINGHOUSE STEP INDUCTION REGULATOR

inherent tendency to hunt if it is set to regulate within close limits has been overcome in the Westinghouse regulator, which can be set for close regulation without hunting and at the same time permits the use of a high electrode travel speed.

The control elements, contactor switches, and relays are mounted on a suitable panel, making a compact regulating device. It is preferable to mount this panel in the transformer room away from the furnace, while in the furnace room proper is located a panel with ammeters showing the current input to each electrode and the control for the regulator as shown. If no instruments are required the small control panel shown is provided.

**Step Induction Regulator.** Certain types of furnaces, usually those with stationary electrodes, such as certain resistance furnaces, require a wide voltage range, depending on the process. Heavy currents are usual in such furnaces. To meet the demands of this service, Westinghouse has devised a step-induction regulator which is furnished in two types: (a) the transformer and regulator integral, (b) the transformer and regulator mounted separately.

The equipment consists of a furnace transformer, induction regulator, selector, transfer switches and current transformer. The voltage is varied by changing the taps on the high-voltage side of the transformer. The regulator is motor-operated, and controlled from a push-button station. The induction regulator and transfer switches operate automatically together to change connections on the high-voltage side, and to give the proper range on the low-voltage side.

Owing to the use of a small induction regulator, the power factor and efficiency of the regulating equipment is exceptionally high. An exact setting may be obtained for any voltage desired within range for which the regulator is designed. The regulator is very simple and its operation easy, a pushbutton or two-way switch controlling the entire voltage change.

**Carbide and Ferro-Alloy Furnaces.**—The electrical equipment usually required for furnaces making carbides and ferro-alloys is similar in general to that furnished for steel refining furnaces, with the exception that these furnaces are of the stationary type and, therefore, no tilting motors are required.

A simple method of calculating the kilowatt hours required per ton of alloy is to take the figures in the following table which have been compiled from furnaces in actual commercial operations.



COMBINED ARC FURNACE REGULATOR AND CONTROL PANEL

Continued on Next Page

## DATA

Alloy	Grade Product Percent	Size of Furnace		Number of Phases	Elec- trode Volts	Percent Recovery	Kilowatt- hrs. per lb. alloy trapped
		Tons Charged	Transfer Kilowatts				
Aluminum magnesium	35.50 Al 70.75 W	1 1.4	75 150	1 1	65 90	75 80-90	1.5 Subtle 2.1 Bfg. 1.7 Total 3.8
Aluminum silicon	60.65 Mo 15.20 Si 43.35 W	1 1	150 150	1 1	65 65	75-80 75-80	77.5*
Aluminum copper	3.48 Si 51.70 Cu 60.65 Cr	1 1 1	150 1000 750	2 1 3	65 60-90 120	75-80 70-80 70-85	3.4 2.5 3 3.4 5 2.2 3 3
Aluminum manganese	78.80 Mn 15	1 12.90	75 12.90	1 3	65 72	75-80 70-85	1.5 2.2 3 3

\*Per lb. of Mo in alloy.

The low tension voltage required of the transformers can also be determined from the table. It will be noted that varied with different alloys. The actual electrode volts given in the sixth column is the voltage measured at the electrode terminals that must be supplied to the furnace and is made up of the arc voltage plus a reasonable allowance for drop in the electrodes. To this must be added, in order to obtain the desired low tension transformers voltage, the calculated resistance and reactance drop in the leads from the transformers to the electrode holders. This, of course, will depend upon the distance between transformers and furnace, upon the size of conductors, upon the amount of interlocking of the leads and upon the skin effect encountered in the conductors. All of these quantities are susceptible of reasonably accurate electrical calculation.

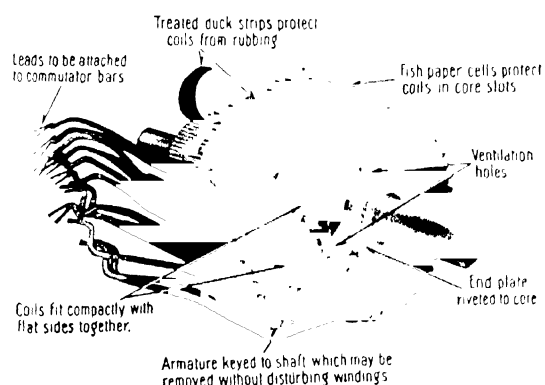
The remainder of the items shown in the table are self-explanatory and present an accurate view of the electrical characteristics required of furnaces and their transformers for melting the more important ferro-alloys.

## MOTORS FOR USE IN THE CHEMICAL INDUSTRIES

A motor for service in chemical plants must be provided with an insulation that not only possesses ordinary mechanical strength and heat resisting qualities but that will withstand the deteriorating action of acids and other fumes. Westinghouse has, after careful investigation and trial under actual operating conditions, produced an acid-resisting motor which it has no hesitancy in offering for use in chemical plants.

The insulation immediately adjacent to the copper conductors, designated as the wrapper, is in contact with the source of heat and, therefore, is subject to the highest temperature of the winding. It is also subject to mechanical stresses, and a slight tendency to abrasion, due to its being next to the metal. Because of the tendency of the acid fumes to carry particles into the coil interior and accelerate the disintegrating action, it is essential that the wrapper be of the very best insulating material, possessing all the qualities mentioned above.

In the Westinghouse motors, the wrapper is built of fishpaper and mica, a combination that affords the required strength, toughness, heat resistance, and insulation.



TREATED COILS USED IN MOTORS FOR ELECTRO-CHEMICAL SERVICE

The individual wound coils are first subjected to vacuum, and then impregnated, which fills all the air spaces between the conductors, and results in a solidly bound coil cemented together both inside and on the surface which effectively seals up the coil and renders it impervious to the action of acid and alkaline fumes.

In any laminated core construction, such as is used with motors, it is impossible to cut a slot which will not present some small projections and irregularities which naturally have a tendency to cut the material which is placed in the slot. To overcome this, Westinghouse uses a tough heavy treated fishpaper which shields the varnish on the completed coil and prevents its surface being cut and scored.

After the individual coils have been assembled in the slots, the entire winding is again subjected to a process of impregnation and drying. The stator with its winding is dipped into a special insulating and acid-resisting compound, removed and baked.

This process is repeated several times and results in a completely saturated coil assembly with a hard and a uniformly smooth surface.

**Protection Against Dust and Dirt**—Motors operating in many industries, such as coal crushing, cement, potash, fertilizer and similar plants, become covered with dust and dirt which gets into the bearings and oil reservoirs. For such motors special protection is provided by means of felt lined covers securely held in place.

**Conduit Wiring**—Most plants employing chemical processes use conduit for carrying the wiring through the different buildings. Standard Westinghouse motors can be furnished equipped with a conduit box as shown in the accompanying illustration. All connections between the motor leads and the wiring are easily made inside the box, after which the cover is fastened on by means of screws. Standard pipe threads are used and the box can be turned at any angle.

**Enclosing Covers**—For certain applications where the fumes are particularly injurious, or for outdoor service, Westinghouse Motors can be furnished with enclosing covers which effectively enclose the openings in the panel of the motor. The bearings of all enclosed motors are dust-proof. Special provision is made for the cooling of these totally enclosed motors.

## ALTERNATING CURRENT MOTORS

For the majority of purposes in chemical, electro-chemical, and metallurgical plants, A. C. motors are employed, although there are numerous instances where D. C. motors can be used to good advantage, as will be explained later.

**Type CS Squirrel Cage Induction Motors**—These motors are particularly adapted to the severe conditions met with in chemical industries since they permit continuous operation, regardless of dust and fumes. They are very simple in construction, consisting primarily of a set of wire windings, rotating part, or rotor, and two bearings. There is no complication of small parts and no sliding

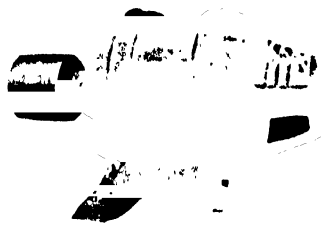


TYPE CS SQUIRREL CAGE INDUCTION MOTOR

Continued on Next Page

electrical contacts. Furthermore, the bearings are dust-proof and automatically oiled and the design of the motors is such that an accumulation of dust does not interfere with the ventilation. The windings are thoroughly impregnated and rendered impervious to oil, moisture, dust and acid or alkaline fumes, as previously explained. The great mechanical strength of these motors enables them to withstand the severe shocks and stresses of constantly driving machinery. Their efficiency is excellent, not only at full load but at fractional and overloads as well. Current consumption with their use is at a minimum. These motors can be supplied in all sizes from 2 to 650 hp.; 2 and 3 phase, 25 and 60 cycles, and for all commercial voltages. These motors can also be supplied with vertical shaft, back gears, and in other special forms.

**Type CW Wound-Rotor Induction Motor**—This motor is suitable for constant and variable speed, continuous duty service, when there is required an A. C. motor capable of yielding a strong starting effort, for instance, in driving air compressors, plunger pumps, positive pressure blowers, conveyors that are required to start under heavy load, centrifugals, hoists, etc. For varying speed service a controller with resistors is furnished to obtain continuous operation on any running point from one-half to full speed. These motors can be supplied in any size and for all commercial voltages and frequencies. Either the constant speed or variable speed type can be adapted for belt-driving, gearing, chain drive or direct connection.



TYPE CW WOUND ROTOR INDUCTION MOTOR

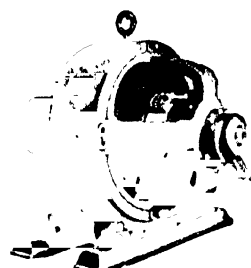
**Type CI Wound-Rotor Induction Motor**—This motor is designed to meet the same requirements as the type CW motor except that it is intended for intermittent instead of continuous service. It is especially useful for cranes, hoists, elevators, certain types of conveyors which have to be started under heavy load, and, in general, on all machines where the duty consists of successive periods of operation, each requiring a strong starting effort. These motors can be supplied in any required size for all commercial voltages and frequencies.

#### DIRECT CURRENT MOTORS

There are a number of applications in industrial chemical plants where D. C. motors are preferable. Typical of these are cases where a wide range of speed adjustment is demanded, as in driving certain types of cranes, hoists, coke charging machines, reels, and coating and finishing machinery in paper and textile plants, paper machine drive, etc. Direct current motors are sometimes preferred in plants where the motor driven equipment is not extensive and where direct current has to be generated for other reasons.

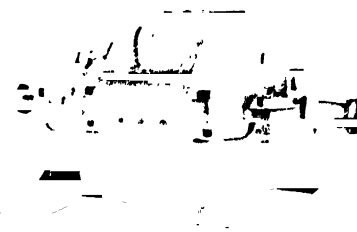
**Type SK Direct Current Motor**—This motor is suitable for either constant or varying speed and finds extensive application for all kinds of machinery. It can be supplied in sizes from  $1\frac{1}{2}$  to 250 hp. and for 115; 230

and 550 volts. It can also be supplied as a vertical motor. Like all other Westinghouse motors, it can be had when desired with specially impregnated windings for chemical plant service and also with totally enclosed frame. In addition to being mechanically suited for driving heavy material handling equipment it is designed to resist the action of grit, dust and fumes and is thus ideal for chemical plants, coke ovens, smelters, etc.



TYPE SK DIRECT CURRENT MOTOR

**Types MC and MCO Mill and Crane Direct Current Motors**—These motors are suited for intermittent service in which the motor for a considerable portion of the time is accelerating, retarding and standing at rest, and seldom operates for any considerable time at a fixed, continuous load. Instances of this are in operating heavy cranes, hoists, etc. These motors are of a special and very rugged construction and have massive dust-proof frames. The insulation is fireproof, the shaft large, and all parts readily accessible. These motors can be supplied in sizes from 6 to 300 hp. for any commercial circuit. At 230 volts, Type MC is totally enclosed, MCO is only partly enclosed. Type MCB is supplied with back geared parts.



TYPE MCO MILL AND CRANE MOTOR

**Type K Direct Current Motor**—This is a series wound totally enclosed motor adapted for heavy intermittent, varying speed service where a severe effort is required, as in driving coke charging machines, cranes, hoists, etc. Hundreds of these motors are in service and their constantly growing use testifies to their excellence. Their special features are compactness, reliability, simplicity, and ease of inspection and repair. For use around by-product coke ovens, fertilizer plants, and metallurgical plants, these motors are ideal, as they possess the necessary mechanical qualities for driving heavy material-handling equipment, and at the same time are designed to withstand the constant grit, dust, and fume-laden atmosphere. The motors can be supplied in any capacity for any commercial circuit.

**Type HK Motor**—Is a more recent design than the type K. It is an enclosed ventilated type, series wound, equipped with commutating poles. These motors are specially designed for cranes, hoists, lift and swing bridges, transfer tables, etc. Type HF brakes are mounted directly on the motor brackets.

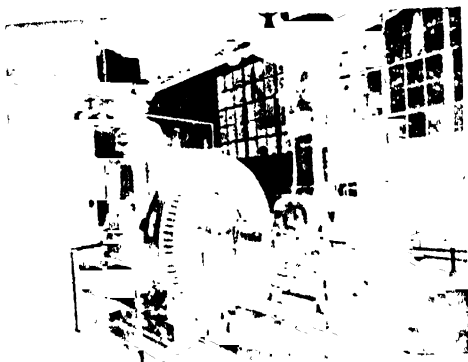


TYPE HK MOTOR

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## SYNCHRONOUS MOTORS

These motors start as induction motors, auto-starters being used for this purpose, and after reaching full speed the motor runs on its synchronous windings, field excitation being furnished by a small D. C. generator, belted to the generator shaft or mounted on it.



**WESTINGHOUSE SELF-STARTING SYNCHRONOUS MOTOR**  
Direct Connected to Compressor

**Type G Synchronous Motor**—This motor forms a desirable means of driving pumps, fans, compressors and other constant speed equipment, because, in addition to driving the equipment, the motor can be so arranged as to raise the power factor of the circuit on which it is operating, which increases the capacity of transformers and transmission lines, gives better voltage regulation and, therefore, lower rates for purchased power. It also increases the efficiency of other motors on the same line. This motor should not be used where the starting conditions are severe, but rather for centrifugal pumps, reciprocating pumps with by-passes, transformers, with unloading devices, etc. This motor can be supplied in all sizes from 30 to 375 h. p. and for all unusual voltages and frequencies.

## SMALL MOTORS

There is a complete line of Westinghouse fractional horsepower motors in sizes from 1/20 up to 2 h. p. These motors can be supplied in the small general types as the larger motors, thus making, with the various types of motors previously described, a complete line of sizes. These small motors can be supplied with all the special features which make the larger Westinghouse motors particularly desirable for industrial chemical purposes, such as specially impregnated windings, totally enclosed frames and conduit wiring. They will be found excellent for a multitude of purposes in the plant where fractional horsepower is required, as they can be located in inaccessible positions and will run for long periods without attention. Owing to their cleanness, quietness and simplicity, they are admirably adapted for laboratory purposes, such as driving stirrers, small mixers, mills, buffing machines, shaking machines, etc.



**TYPE CAH MOTOR**

## STARTING SWITCHES AND MOTOR CONTROL

For each type of Westinghouse motor there is a suitable form of starting and control equipment. Many of these are particularly adapted to the needs of the chemical industries on account of the precautions taken to eliminate fire and explosion risk. They are also designed so no essential parts are exposed to corrosion.

**Type 815 and 816 Quick-Make and Quick-Break Starting Switches**—For use with A. C. squirrel cage induction motors 1 to 25 h. p., 110 to 880 volts specially valuable in plants where inflammable dust, gases or explosive material are present, since they furnish complete protection to both workmen and machinery and eliminate the use of fuses with the consequent danger and loss of time in replacing them. The fire hazard is reduced by the use of asbestos barriers, which permit the elimination of oil, when explosive gases are present and explosion hazard out-weighs fire hazard, contacts can be immersed in oil. These switches may also be used as line switches for wound rotor induction motors. Furnished with or without overload and low voltage release.

**TYPE 815 STARTING SWITCH**

**Type T-2 Starter**—A starter of the oil immersed drum type for induction motors of from 1 to 3 h. p. reversing or non-reversing.

**Type A Auto-Starters**—A handy self-contained starting device consisting of an oil immersed switch, auto-transformer, low voltage protective device and overload relay, all mounted in a steel enclosing case. The starter handle has three positions—start, off and run, each being plainly marked on the starter case, the handle will not remain in the start position unless held. This is a fire proof, explosion-proof, corrosion-proof and fool proof starter, especially suited for use where motors are operated by unskilled labor. Adaptable to any A. C. squirrel cage induction motor.

**TYPE A AUTO STARTER**

**Type DM Rheostats**—Designed for use in chemical plants, mines, etc., where dampness and corrosion are present. Current carrying parts thoroughly protected against acid and moisture. Of strong, compact, fire-proof construction. These can be used for any D. C. motor and for all other purposes where a reliable fire proof corrosion proof rheostat or controller is needed. Where the corrosion-proof feature is not important specify type D instead of type DM.

**Automatic Starters, Type C and Type F Automatic Starters** are used for all A. C. and D. C. motor applications where the advantages of remote control and automatic starting and stopping are desirable. A complete line of the starters is available.

**TYPE C AUTOMATIC STARTER**

## BLOWERS AND FANS

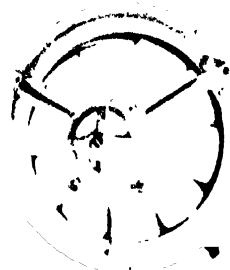
Certain types of Westinghouse motors have been designed for driving standard and special blowers and exhausters. These motors are characterized by very great reliability. This is of the utmost importance in the chemical industries where operations are continuous and where shutdowns of blower equipment cannot be tolerated. Numerous instances could be mentioned where Westinghouse motors driving blowers have run continuously for long periods of years without any attention other than lubrication. These advantages are so generally recognized that Westinghouse motors have been adapted as standard by some of the principal builders of blower equipment.

*Continued on Next Page*

**Westinghouse-Ventura Exhaust Fans**—These fans provide a most efficient means of removing moisture, fumes, and odors from work rooms and buildings, in which chemical processes are being carried on. They are extensively used for removing the moisture from buildings in which drying operations are being carried on, as in paper mills, or where there is constant moisture from large open tanks containing heated liquids. Best adapted to service where the air is drawn directly from the room to be ventilated and is exhausted into the open or where the inlet and exhaust pipes are so large in diameter and so short in length they offer very little resistance to the passage of the air, as in cases where the air is led through long pipes, or pipes of small diameter. For such service other Westinghouse fan and exhausters can be supplied.

These fans are quiet running, very efficient, simple to control and can be operated from an ordinary lighting circuit, no starting device being required other than a simple snap or knife switch.

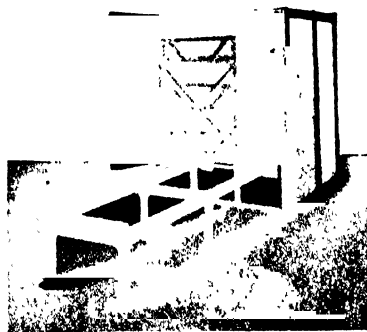
The motors, which can be either D. C. or A. C. are designed for this service, being totally enclosed so as to be protected from dust, dirt and moisture, and when necessary being specially impregnated so as to resist acid and alkali fumes. In addition to their use in plant operations, these fans are ideal equipment for ventilating laboratories, offices, factory, dining rooms, etc.



WESTINGHOUSE-VENTURA  
FAN

#### INDUSTRIAL HEATING

The principal arguments for the use of electricity as a heating agent in industrial chemical plants are: Freedom from risk of fire and explosion; Cleanliness; Ability to regulate closely, and adaptability to automatic regulation; Reliability; Increased production and economy. The best evidence that the advantages claimed for electricity in industrial heating are actual, is the constant increase in the number and variety of electrically heated ovens, dryers, and other equipment used. Westinghouse industrial heating equipment affords an electrical solution for almost every industrial heating problem.



TYPE N-1 ELECTRIC OVEN

Westinghouse electrically heated ovens may be classified under four general divisions as:

**Hand-Operated Kiln or Box Type Ovens**—An insulated box, or room, containing the necessary number of heating units, into which the material to be dried, baked or otherwise processed is carried by hand and placed in suitable trays, racks or hooks.

**Truck-Operated Kiln or Box Type Ovens**—Similar to the hand operated oven described above except that the work is loaded on trucks which are wheeled into the oven in which they remain with the material.

**Semi-continuous Conveyor-Type Oven**—Consists of an oven having a door at both ends, with an overhead conveyor running directly through the oven. This type of oven is especially suited for enameling and lacquering. The work is hung on the conveyor outside the oven and, after a suitable draining

period, the conveyor is started and the work carried into the oven. While this batch is being baked, a second batch is being dipped and hung on the conveyor. As soon as the first batch is baked the conveyor is started again and the first batch carried out of the oven as the second is carried into it. This operation is repeated indefinitely.

**Continuous Conveyor-Type Oven**—Similar to the semi-continuous, but operates continuously, the work being hung on a conveyor or chain and moving constantly into, through and out of the oven. The speed, the length of the oven and the temperature are so arranged that the process is complete by the time the work passes out. To prevent heat losses and fumes an exhaust fan is used.

**Efficiency**—The efficiency of the above types of ovens expressed in pounds of finished product per kw-hr. power consumption (assuming ovens of the latest of each of the respective types, having the highest grade insulation, proper ventilation and intelligent operation) is:

Kiln type, hand-operated: 6 to 8 pounds per kw-hr.

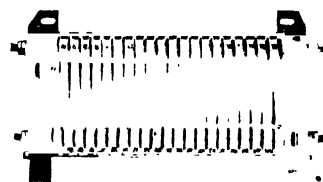
Kiln type, truck-operated: 10 to 12 pounds per kw-hr.

Semi-continuous conveyor-type: 10 to 12 pounds per kw-hr.

Continuous conveyor-type: 25 to 30 pounds per kw-hr.

**Heating Units**—The number of heating units for any given installation will depend on the amount of material being dried or baked, the nature of the material, the maximum temperature required, the time required in which to reach maximum temperature, the system of ventilation and the location of the heaters in the oven. Full information covering the above points should be given in making inquiries concerning industrial heating equipment.

The heating units are rated at 25 kw, at 110-volts, a sufficient number being installed in the oven or dryer to attain the required amount of heat, and units being arranged in series when necessary to take care of higher voltages.



TYPE C HEATER UNIT

The location of the heaters depends on the general design of the oven. For instance when trucks are used the heaters may extend only a definite distance above the floor line, in which case it is sometimes necessary to place heating units elsewhere in order to provide sufficient heat. Generally speaking, the heating units can be located anywhere in the oven that the particular conditions to be met may call for.

The heating element consists of a metallic ribbon wound on a number of fire clay bushings on two steel tie rods, between two pressed steel end plates.

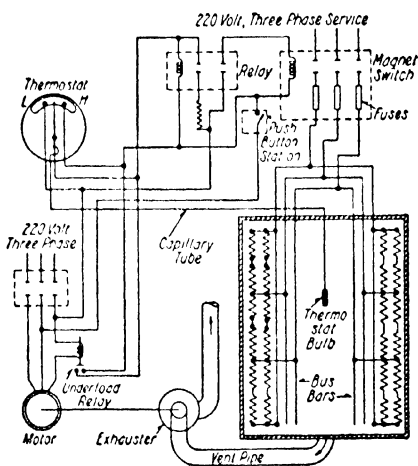


DIAGRAM OF CONNECTIONS

Automatically Controlled and Ventilated Electrically Heated Oven on three-phase, 220-volt Circuit

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Great care has been exercised in the design of the heating unit. Sharp bends in the ribbon have been eliminated since it has been found that they have been one of the chief sources of trouble in heating units, owing to the fact that at such points the expansion and contraction of the ribbon causes crystallization and breaking. Connections from unit to unit and to bus-bars are of flat cold rolled steel. Heaters are designed for hanging up on angle or channel iron, strap iron, or pipe without any holes, thus eliminating all drilling of ironwork in the oven and permitting quick and easy installation, re-arrangement and replacement. The ribbon is non oxidizing and has been developed by careful research to give maximum efficiency in heating.

#### IMMERSION HEATERS FOR INDUSTRIAL USE

Westinghouse type B, Bayonet Immersion Heaters can be used for heating large quantities of water and various liquids other than acids. Also for indirect melting of glue, paraffine, tar, and other viscous substances. These heaters are very useful in the construction of thermostats for experimental and manufacturing processes. A multitude of other applications in the laboratory and plant will immediately suggest themselves.

#### "SPACE" HEATERS

"Space" heaters are suitable for any application except when an immersion type of heater is required. They are used for heating small ovens and drying rooms where the temperature of the air surrounding the heater is not more than 800° F. (430° C.) and where there is good circulation of air. They are also used for heating press heads and rolls where the heaters are clamped between heavy plates. Owing to the elimination of fire risk, dirt, and soot, they are ideal for such service, and are used extensively in the manufacture of hard rubber goods, insulating material, bakelite products, paper board products and hard fiber products. In the experimental laboratory they are invaluable.

#### WESTINGHOUSE ELECTRICALLY HEATED HOT TABLES

This form of equipment is a substitute for steam tables in manufacturing operations where substances have to be worked on a flat surface under definite temperature conditions. They permit of more exact temperature control than is possible with a steam table, and frequently produce a considerable saving in raw material, for instance in the manufacture of miscellaneous articles, such as combs from celluloid.

**Westinghouse Dry-Type Glue Pots**—The dry-type glue pots have been shown by test and practical experience to be designed absolutely correct to give the proper working temperature of the glue without attention. They have a separate glue vessel which can be taken out and cleaned; the glue pot is cheap to operate, costing as much as an ordinary incandescent lamp and can be connected to the lamp socket. Very efficiently constructed and saves an enormous amount of time and reduces wastage of glue to a minimum.

#### MISCELLANEOUS WESTINGHOUSE HEATING APPLIANCES

Small heating plates, which are particularly useful for heating inflammable liquids owing to the absence of flame; glue pots; soldering pots; disc immersion heaters; laboratory and domestic hot plates, etc., embody the highest efficiency in design and suggest themselves for numerous uses in laboratories and plants.

#### AUTOMATIC CONTROL OF INDUSTRIAL HEATING EQUIPMENT

All Westinghouse ovens and other industrial heat-

ing equipment can be arranged for automatic control thus entirely eliminating the personal factor in drying, baking and processing operations, insuring uniformity of production and maximum economy in power and materials.

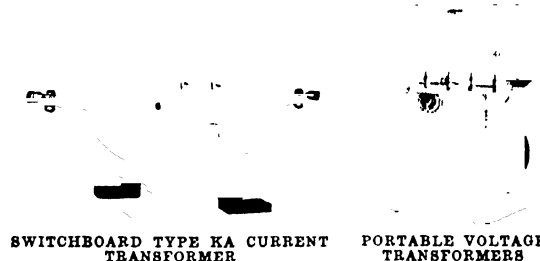
#### TRANSFORMERS

The special type of Westinghouse transformer required for use in connection with electric furnaces and for the Cottrell process have already been discussed on pages 949 to 952. In addition to these special types there is an extensive and complete line of Westinghouse transformers suitable for all power and distribution purposes, making possible the use of different forms of power by stepping-up the voltage at the source and stepping it down where wanted. These are supplied by Westinghouse in any size or voltage, either single or 3-phase to meet any specific requirements. Three types of cooling are included—self-cooled, water-cooled, and air-blast. On all Westinghouse transformers, the greatest attention is paid to insulation, ventilation and mechanical strength. Westinghouse principles of transformer design have been arrived at through painstaking study, during many years of successful transformer operation, guaranteeing long life and efficient performance, and security against breakdown. Although Westinghouse has built some of the largest transformers ever designed or orders for small transformers receive equally careful attention.

**Distributing Transformers**—Capacity from 1 to 200 kv-a. and voltages from 460 to 34,500 volts can be supplied, in pole, platform, or manhole mountings, single or three-phase, so as to take care of every possible operating condition.

**Instrument Transformers**—Current transformers are manufactured for any value of primary current up to 10,000 amperes, the secondary usually being 5 amperes. For use with any voltage installation up to 75 volts for both indoor and outdoor service.

14,000 KV-A., 150,000 VOLT, O. I.  
W. C. SINGLE PHASE WEST-  
INGHOUSE TRANSFORMERS  
For Supplying Current to Synchron-  
ous Converters on Electrolytic Work



Voltage Transformers are also manufactured for both indoor and outdoor service for primary voltage up to 60,000 volts, the secondary voltage being 100 volts. A complete line of the above transformers can be furnished for any standard capacities and ratings.

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### VOLTAGE REGULATORS

The special type of regulator required in connection with electric furnaces has already been dealt with on page 952. In addition to this Westinghouse supplies a complete line of voltage regulators for indoor or outdoor use, capable of providing a steady normal voltage for any industrial use of electric power. This equipment is supplied in a great variety of capacities and designs so as to take care of all possible operating conditions.

VOLTAGE REGULATOR  
With Dust Proof Case

### RECTIFIERS

Westinghouse-Cooper Hewitt Mercury Rectifier outfits are manufactured in sizes ranging from 2 to 120 volts D. C. and from 5 to 50 amps. capacity, to be operated from either 110 or 220 volts A. C. 60 cycle source of supply. They are used for changing alternating to direct current. Are easy to install and require little space, and their cost is low compared with other devices used for changing alternating to direct current. They are very simple to operate and, with the exception of the automatic type which has a tilting mechanism, they have no moving parts. The regulation of power is effected by means of an auto-transformer, so that power is not wasted.

WESTINGHOUSE  
COOPER-HEWITT  
MERCURY RECTIFIER

### RECTIGONS

In addition to mercury arc rectifiers, Westinghouse manufactures a line of rectifiers known as "Rectigons." These are hot cathode rectifiers and use an Argon gas-filled bulb. They will do the same work as the mercury arc rectifiers, but are limited to a 6 amp. 75 volt D. C. capacity. They are manufactured in three sizes, 2½ to 1½ amp., at 6 to 15 volts, 6 to 3 amp. at 6 to 15 volts, and the larger outfits have a capacity up to 6 amp. at from 2 to 75 volts. These battery chargers are very economical and where a small capacity charger is desired, they will prove more satisfactory and are less expensive.

**Battery Charging Outfits**—In addition to the rectifier and rectigons, Westinghouse can supply complete battery charging outfits for charging either lead or Edison cells for use in vehicles, signal and alarm systems, telephones, experimental work, etc.

### HAULAGE LOCOMOTIVES

Baldwin-Westinghouse Locomotives of the mine type are designed to give continuous service, and therefore, maximum production. The two most important features of these locomotives are the Barsteel frame, and the commutating-pole motors with oil-and-

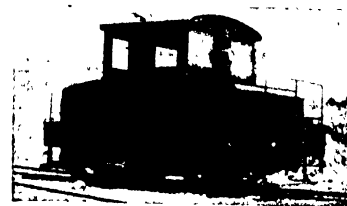
waste lubricated bronze bearings. Other features include accessibility, simplicity, efficiency of operation and general ruggedness of design.



BALDWIN-WESTINGHOUSE BARSTEEL LOCOMOTIVE  
For Industrial Use

The storage battery locomotive is particularly adaptable to gathering service and underground haulage, where there are difficulties in erecting and maintaining trolley wire and in bonding the rails, or where wooden rails are used.

For general work wholly on the surface, the addition of a cab or canopy is desirable. Operating under any of the above conditions, it is entirely reliable and very easily handled.



BALDWIN-WESTINGHOUSE BARSTEEL LOCOMOTIVE  
With Cab Located at Center

### ARC WELDING EQUIPMENT

Owing to the continuous nature of most manufacturing operations in the chemical industry, shutdowns are particularly costly and undesirable. Westinghouse Electric Arc Welding Outfits are an important item in insuring any industrial chemical plant against breakdowns. The equipment can be supplied in either stationary or portable forms. The operation of the process is simple and can easily be learned by an intelligent mechanic. Westinghouse arc welding equipment can be used in making repair arc tanks, kettles, iron and steel parts for securing iron and steel together or for cutting tanks and structural steel, which is frequently necessary in making alterations and repairs to plants.

The portable outfit consists of a motor-generator and control panel mounted on a truck. The generator has a capacity of 175



COMPLETE WESTINGHOUSE A. C. D. C. PORTABLE ARC WELDING UNIT

*Continued on Next Page*



amperes. The motor can be either A. C. or D. C. as required by the power circuit. The control equipment consists of a small panel on which is mounted a field rheostat, voltmeter, ammeter, and 2-pole main switch.

### STEAM TURBINE GENERATOR UNITS

Westinghouse steam turbines of the reaction or Parsons Type or embodying a combination of the impulse and reaction principles, depending upon the particular problem to be met, can be supplied in any capacity for either condensing or non-condensing service.

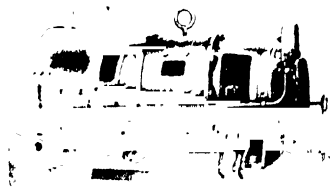


TWO 2500 KW. LOW PRESSURE STEAM TURBINE UNITS

Westinghouse engineers have designed numerous turbine-generator power installations ranging in size from the largest equipment of this class ever constructed down to very small units for the operation of chemical plants. These installations can be so designed as to provide both mechanical power and necessary steam for heat and process requirements under conditions of maximum economy.

### SMALL STEAM TURBINES

Small direct current non-condensing turbine generator units are built in capacities from 5 to 15 kw. and provide a very compact lighting outfit for small plants.



SMALL DIRECT CONNECTED LIGHTING SET

Larger non-condensing turbine generator units built in capacities of 25 to 1,000 kw. are ideal as the main unit in plants where considerable exhaust steam is needed for operating evaporators, stills and other equipment.

**Turbines for Driving Machinery**—For driving centrifugal pumps, fans, blowers and boiler room auxiliary equipment, a complete line of small turbines is offered which can be arranged either to be direct connected to the apparatus or to be used with reduction gears.



CONDENSING TYPE TURBINE GENERATOR UNIT

### CONDENSERS

Westinghouse Leblanc Condensers are offered in three different types—surface condensers, jet condensers, and barometric condensers. Because of their efficient performance



UNIT TYPE SURFACE CONDENSER

these condensers have become generally known as High Vacuum Condensers. They cover the entire line of application of condensers to prime movers, the type recommended depending upon the local conditions. They have been manufactured and applied to turbines of all capacities up to 100,000 horsepower. All Westinghouse con-

LARGE SURFACE CONDENSER

densers are equipped with Leblanc air handling equipment.

### STOKERS

There are three types of Westinghouse stokers, the Roney, the Underfeed and the Chain Grate Stoker. Thus it is not necessary to specify one type for every requirement, as one of these types is always preferable to meet conditions peculiar to each installation.

The Roney stoker is one of the overfeed type and particularly adapted to tubular boilers and for purposes of the mod-



TWIN JET CONDENSER



RONNEY STOKER

erate sized plant. The Underfeed stoker is of the multiple retort type. This stoker is especially desirable where sudden increases in steam demands must be met as in sulphite pulp and paper mills. Where max-



UNDERFEED STOKER

imum reserve capacity of 250, 300 or 400 per cent of rating is required, this type of stoker should be used. It requires forced draft which can be obtained from Westinghouse blower installations.



CHAIN GRATE STOKER

*Continued on Next Page*

The Chain Grate stoker is of the traveling grate type and gives excellent results where the loads are moderate but should not be used where reserve capacity exceeding 200 per cent of boiler rating is required.

#### WATERWHEEL GENERATORS

The first hydro electric plant in America was equipped with Westinghouse apparatus and is still in successful operation. Since then Westinghouse engineers have designed many and varied hydro electric installations and the accumulated experience of the Company in this line is at the service of those in-

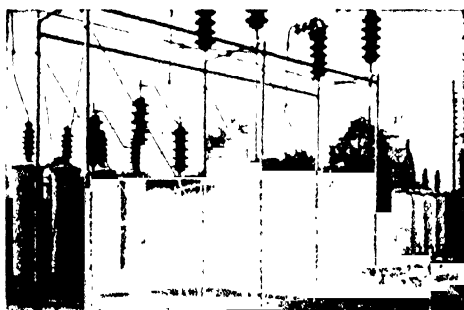


WATERWHEEL GENERATORS AT RUMFORD FALLS, ME

terested in hydro-electric developments, small or large, in connection with electrochemical plants, pulp and paper mills, smelters, etc. Westinghouse is prepared to build W. W. driven Generators of any capacity from 50 to 50,000 kv.-a.

#### LIGHTNING ARRESTERS

Westinghouse supplies a complete line of lightning protection equipment suitable for protecting all kinds of transmission lines from both atmospheric lightning and internal surges. This equipment includes many forms of spark gap, electrolytic and horn-type arresters suitable for heavy service.



TYPE AK OUTDOOR ELECTROLYTIC LIGHTNING ARRESTER

At Edgewood Arsenal, Md.

**Choke Coils**—Indoor and outdoor choke coils either with or without oil immersion for all voltages up to 220,000 volts can be supplied to meet every requirement for this type of equipment.

**Westinghouse Switchboard Equipment** can be obtained to meet any commercial demand that may arise in the control and application of electric current.

For large applications, the facilities of our Engineering Department are available to insure the best design and layout for any installation. For small applications, such as motor generators, a standard line of

panels has been developed as listed in our Catalog of Electrical Supplies, 1921-1922. When desired, automatic reclosing carbon circuit breakers can be supplied to insure that circuits do not remain open when overload conditions are met. Thus, power can be automatically put back on the circuit soon after these conditions have been overcome. In applications of this nature standard panels, as mentioned, will be found particularly desirable.

#### INSTRUMENTS, ELECTRIC

**Switchboard, Indicating**—A complete line of switchboard indicating instruments can be furnished for any need. For direct current, Westinghouse manufactures ammeters and voltmeters, 2 $\frac{1}{16}$ "", 3", 4 $\frac{3}{8}$ ", 5" and 7" in diameter for all standard commercial ratings. For alternating current circuits there is a line of ammeters, voltmeters, wattmeters, power factor meters, reactive factor meters, frequency meters and synchroscopes, 7" in diameter, for any standard commercial ratings. These instruments are rugged, compact and very accurate and will meet all requirements.

**Portable, Indicating**—Portable instruments for every purpose are available. Westinghouse has two general sizes for direct-current service, one a pocket size and the other a larger size for laboratory and factory testing. When used in conjunction with standard portable shunts, the direct-current ammeters can be used for making tests on any standard direct-current circuit. For alternating-current service a complete line of instruments are available for measuring amperes, volts, watts, power factors and frequencies. These instruments are designed to be used in every class of service and for all standard commercial ratings. Each instrument is designed for the highest accuracy consistent with general testing.

**Precision**—These instruments are used as calibrating standards for watt-hour meters, switchboards and portable instruments, and for general laboratory work. They possess a high degree of accuracy and are very simple in both their mechanical and electrical construction. They can be furnished as ammeters, voltmeters and wattmeters.

**Graphic Recording**—Two types of graphic instruments are made for recording amperes, volts, watts, power factors and frequencies for any standard commercial capacities and ratings. The first is the **Type M** Graphic, which operates on the relay principle, the measuring element consisting of the well-known Kelvin appliance which operates on an auxiliary circuit by means of contacts. The auxiliary circuit operates a recording pen and a mechanism for driving the paper. The most accurate records obtainable can be had with these instruments.

The second is the **Type U** used where graphic instruments, easily operated, of light weight, and reasonably accurate are required. They are furnished as ammeters and voltmeters for both alternating and direct-current service for any normal operating conditions.

**Relays, Protective**—A complete line of protective relays used in selective tripping of circuit breakers for modern transmission and distribution systems are available. The necessity for continuity of service, together with the complications of modern trans-



TYPE CO OVERLOAD RELAY

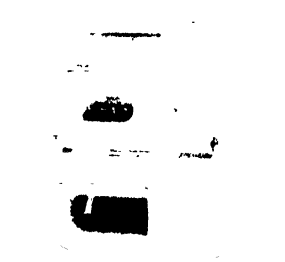
*Continued on Next Page*

mission and distributing systems makes it necessary to consider very fully the question of suitable protective relay equipment. For protecting apparatus such as generators and transformers relays are often found essential. Westinghouse relays operate on the induction principle and their use will prove very beneficial in large operating systems.

**Other Meters**—Westinghouse manufactures demand meters and watt-hour meters for use on any alternating or direct-current circuits. These meters are made in various types to meet every requirement



TYPE RO WATTHOUR  
DEMAND METER



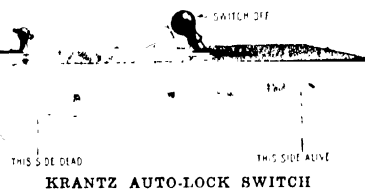
TYPE RA RECORDING DEMAND  
WATTHOUR METER

and their use assures the greatest accuracy obtainable for this class of metering work.

#### KRANTZ AUTO-LOCK SAFETY ENCLOSED SWITCHES

Krantz Auto-Lock switches are particularly desirable in chemical plants or other factories where inexperienced help is employed to operate motors, and where switches must be placed in locations subject to damage from passing trucks or material. These switches are enclosed and are absolutely safe under all conditions.

Brush moving contacts are used instead of the knife blade form of contact previously used in switch construction.



KRANTZ AUTO-LOCK SWITCH

The switch parts are mounted inside of a sheet steel box so that the door over the fuses is automatically locked when the switch is in the closed position.

The door can be opened when the switch contacts are open and held open by a catch, and when in this position, the switch contacts cannot be closed. Also, when the switch is in the open position, the contact brushes completely obstruct the passage between the fuse chamber and the live contact chamber, thus rendering it impossible for a person to reach his hand in far enough to touch the live contacts.

#### CIRCUIT BREAKERS

Type H oil circuit breakers are small-capacity manually-operated single-throw breakers for indoor dust proof wall mounting, and weather proof, wall or pole mounting for outdoor use. These breakers are particularly adapted for industrial use when there is need for a simple, reliable, and at the same time inexpensive oil circuit-breaker. They are particularly well adapted for controlling motor circuits or other low power-factor circuits requiring the use of an oil type breaker. The distinctive features are: compact-

ness of form; submersion and openings of all contacts under oil; open position maintained by gravity; ability to remove tank without disturbing the operating mechanism, thus greatly facilitating inspection; ample contacts of the butt type which open quickly.

Type F-6 oil circuit breaker is designed especially for starting three-phase squirrel cage induction and self starting synchronous motors up to 720 hp., when used in connection with auto transformers. This breaker protects the motor while running from heavy overloads and short circuits, and when starting protects it from the sudden application of full voltage after it has slowed down, or come to a rest following an interruption of power supply.

#### INSULATING MATERIAL

Westinghouse research engineers have developed a great variety of insulating materials, which are now manufactured by the company for use in Westinghouse electrical equipment, and for sale for all purposes. These are too numerous and varied to be described in detail here. It is sufficient to state that a suitable insulating material can be supplied for any manufacturing or experimental purpose.

#### INSULATING OILS

Westinghouse supplies oils for all insulating purposes requiring this class of insulation. Users of electrical equipment requiring oil as an insulation can feel assured that Westinghouse insulating oils are the best obtainable.

#### BAKELITE MICARTA

This is the name of a remarkable material developed by Westinghouse engineers. While primarily an insulating material, it is also a superior product for many other purposes, and in addition is used in the Westinghouse works in a great variety of applications as well as widely sold to other manufacturers. Chemical engineers will find it advantageous to acquaint themselves with the property of this economic material, which is already being used for insulation of all kinds, water meter discs, pumps, valves, noiseless pinions, etc.

It can be supplied in plates, tubes, or rods. It has high dielectric and mechanical strength, and resists the action of water and most chemicals, including all the ordinary solvents. It has a very low coefficient of expansion, and a high coefficient of friction when desired. Not subject to destruction by rodents.

#### WIRING DEVICES

Westinghouse has developed a very complete line of wiring devices, including everything necessary for any plant or laboratory wiring system, and for connecting all kinds of small electric equipment.

#### LIGHTING EQUIPMENT

The Westinghouse Lamp Company has made a special study of the lighting of industrial plants and is prepared to offer any advice regarding the design of the lighting system without any expense. The Company furnishes a complete line of incandescent lamps for mill and factory lighting.



TYPE F-6 OIL CIRCUIT  
BREAKER

# WESTON ELECTRICAL INSTRUMENT CO.

115 WESTON AVENUE, NEWARK, N. J.

New York  
Chicago  
Philadelphia

Boston  
Cleveland  
Detroit

St. Louis  
San Francisco  
Buffalo

Minneapolis  
New Orleans

Jacksonville  
Rochester

Seattle  
Denver  
Miami, Fla.

Cincinnati  
Pittsburgh  
Richmond

Toronto  
Montreal  
Halifax  
Winnipeg

Vancouver  
Calgary, Alta.  
London, Ont.  
Stockholm

Petrograd  
Copenhagen  
Christiania  
Helsingfors  
Johannesburg

Calcutta  
Bombay  
Melbourne  
Sydney  
Auckland

Mexico City  
Rio de Janeiro  
Amsterdam  
Brussels  
Buenos Aires

Havana  
Dutch East Indies  
Barcelona  
Geneva  
Lima

## PRODUCTS

Indicating Electrical Measuring Instruments, both Switchboard and Portable, with accessories, for use on A. C. and on D. C. circuits, for every standard or special commercial or scientific purpose.

### A. C. SWITCHBOARD INSTRUMENTS

This group includes Wattmeters, both Single and Polyphase, Voltmeters, Ammeters, Power Factor Meters, Frequency Meters and Synchroscopes. These Weston Instruments are of the Round Pattern, flat-faced style, with extremely open and legible scales. All except the Synchroscopes are made in two sizes, 9½ and 7½ inches diameter. The Synchroscopes are made only in the larger size. All instruments of one size have an exactly uniform front projection.

These Weston Instruments possess radical advantages over any other form or make of instruments intended for the same purpose. The scales are very open and legible, those of the Wattmeters uniform throughout their entire length and of the Ammeters and Voltmeters practically so throughout their upper two-thirds. The accuracy is guaranteed within 1% of full scale value. See Bulletins 1502 and 1503.

### A. C. PORTABLE INSTRUMENTS

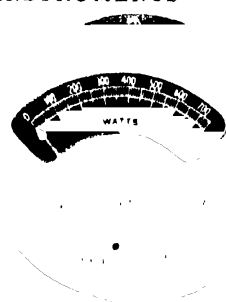
Two major groups of Weston Instruments come under this heading.

(1) A group of **Precision** Instruments guaranteed to an accuracy of ¼ of 1% on Alternating or Direct Current Service, comprising Electrodynamometer type Ammeters, Voltmeters, Single and Polyphase Wattmeters and Transformers of unequal accuracy and serviceability.

The feature of equivalent accuracy on Direct or Alternating Current Service is extremely valuable from the standpoint of ease of standardization on Direct Current.

Consult Bulletins 2001-2-3-4.

(2) A group of high-grade general **Testing** Instruments for use on Alternating Current Service only. The accuracy is within ½ of 1% of full scale value.



MODEL 343, SINGLE PHASE  
AND DIRECT CURRENT  
WATTMETER

MODEL 341 PORTABLE  
A. C. AND D. C. VOLTMETER

This group includes Voltmeters, Ammeters and Milliammeters. Consult Bulletin 2005.

There are also many other Weston types of models such as Capacity Meters, Potential Transformer Comparators, etc.

### D. C. SWITCHBOARD INSTRUMENTS

There is a Weston instrument for every purpose. Each Model is the highest exponent of the instrument maker's art for the class of service and purpose for which it is designed.

Most of the standard models are described in Bulletins Nos. 20 and 21, but innumerable modifications of standard instruments are made more or less regularly to meet specific needs. If no one of the standard listed types exactly meets your requirements, correspondence is solicited.

### D. C. PORTABLE INSTRUMENTS

Weston Portable Instruments are the acknowledged standards for Direct Current Service throughout the world.

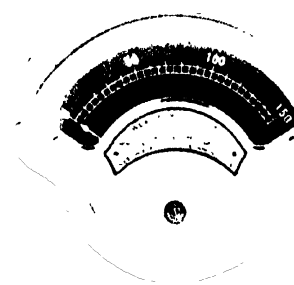
They include Ammeters, Milliammeters, Microammeters, Voltmeters, Millivoltmeters, Voltammeters, Ohmmeters, Galvanometers, etc., in a variety of sizes, grades and costs to meet every practical requirement.

Laboratory Standard Instruments are also available for either Direct or Alternating Current Service.

Bulletins 501 and 1002 contain detailed information.

### EXPERIENCE

In our experience of 33 years we have been called upon to solve so many problems in electrical measurements that we have developed a host of Instruments of special characteristics. Should anyone fail to find in our Bulletins an instrument that will exactly meet his need, we urge that full details of the requirements be submitted to us in correspondence so that we may offer suggestions and recommendations.



MODEL 267  
SWITCHBOARD VOLTMETER  
One of the Miniature Precision Group



MODEL 45 (SHIELDED) PORTABLE  
DIRECT CURRENT VOLTMETER

# WHEELER CONDENSER & ENGINEERING CO.

Complete Condensing, Pumping, and Evaporating Equipment

CARTERET, NEW JERSEY

## BRANCHES

New York  
City, N.Y.  
Boston

Philadelphia  
Pittsburgh  
St. Louis

Cincinnati  
Denver  
San Francisco

Charlotte  
New Orleans  
Atlanta

Salt Lake City  
Los Angeles  
Seattle

Cleveland  
Birmingham  
Tacoma

London  
Shanghai  
Tokyo

## PRODUCTS

Manufacturers of Lillie vapor-reversing evaporators; Crescent Brand seamless drawn brass and copper tubing and pipe; complete condensing equipment; high vacuum surface, jet and barometric condensers; Wheeler-Edwards air pumps; rotative dry vacuum pumps; turbo-air pumps; steam jet air pumps; centrifugal pumps; cooling towers of wood and steel; feed water heaters; receivers; reheaters; expansion joints; atmospheric relief valves.

## BULLETINS

Descriptive bulletins are issued on all our products and will be sent on request.

## CRESCENT BRAND SEAMLESS DRAWN TUBING AND PIPE

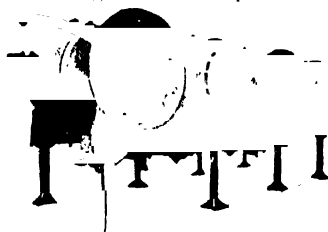
The Wheeler tube mill makes a specialty of tubing and pipe for the chemical industries in copper, brass, Muntz, Admiralty and other non-ferrous alloys; tinned inside or outside or both; all standard sizes and gages, cut to required lengths; pipe sizes threaded when so ordered. Carefully selected materials, the most approved mill methods and an intensive system of inspection and testing are factors which make it possible for us to furnish tubing adapted to the special requirements of any service. No specifications too exacting.



SEAMLESS  
DRAWN TUBING

## EVAPORATORS

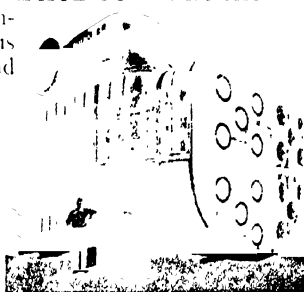
We are exclusive manufacturers of Lillie vapor-reversing evaporators in single and multiple effects. They have special features of mechanical circulation, film evaporation, vapor-reversibility; require less space and have higher thermal efficiency than any other evaporators made.



LILLIE VAPOR REVERSING  
QUADRUPLE EFFECT

## HIGH VACUUM SURFACE CONDENSERS

For service in connection with various chemical processes and turbines of any capacity. The compartment type can be cleaned while in service without shutting down the turbine. The auxiliary tube-plate type eliminates trouble from leakage of circulating water into the condensing chamber.



FIFTY THOUSAND SQUARE FOOT  
SURFACE CONDENSER

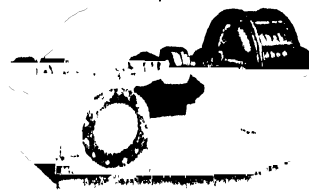
Shown on test 300,000 lb. steam condensed per hour, vacuum 29.53" corrected to 30" barometer. Equipped with Wheeler Turbo-Air Pump.

## WHEELER JET CONDENSERS

Of spray-distribution type of any size for every service to maintain vacua up to 28 and 29 in.

## CENTRIFUGAL PUMPS

High efficiency double-suction pumps for any service, circulating, hot well and tail pumps for condensers a specialty. Built in single stage horizontal and vertical shaft, and multi-rotor types; in all sizes; for any drive, lead, iron or bronze fitted to suit conditions.



WHEELER MOTOR DRIVEN CENTRIFUGAL PUMP  
Also made for Turbine or any other drive

## WHEELER-EDWARDS AIR PUMPS FOR AIR AND CONDENSATE

Eliminate expense of independent air and hot well pumps. No suction or bucket valves. Single, twin or triplex types, any drive.

## TURBO AIR PUMPS

High speed rotary type for jet or surface condensers, directly connected to turbine or motor. Highly efficient and reliable.



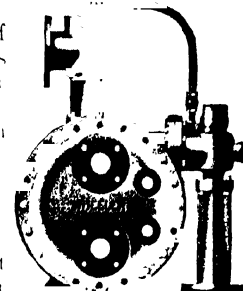
## ROTATIVE DRY VACUUM PUMPS

For high vacuum condenser work; maintains a vacuum within 0.5 in. of barometer.

WHEELER  
TURBO AIR PUMP

## STEAM JET AIR PUMP

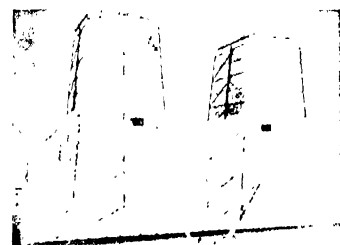
Has exclusive feature of two jets working in series with a condenser between the jets, which enables it to produce higher vacuum with much lower steam consumption than any other type ejector pump made.



WHEELER STEAM JET  
AIR PUMP, PATENTED

## COOLING TOWERS

Cool the water to lowest temperature possible under prevailing conditions, and require less power input per gallon of water cooled than any other tower made. Standardized unit construction permits additions to meet increased needs. Built in all sizes and capacities, of wood or steel, in every draft combination.



WHEELER WOODEN NATURAL DRAFT  
COOLING TOWER  
Capacity 500,000 gal. per hour

# C. H. WHEELER MANUFACTURING COMPANY

## PHILADELPHIA, PA.

BRANCH OFFICES  
 New York Boston Chicago Pittsburgh Cleveland Charlotte Seattle San Francisco

### PRODUCTS

Surface, Jet and Barometric Condensers. Radojet Ejector Type Vacuum Pump, Rotrex Rotary Type Vacuum Pump, Mullan Reciprocating Type Vacuum Pump. Rotative Dry Vacuum Type Pump, Single Direct Acting Type Vacuum Pump. Centrifugal Pumps, Natural and Forced Draft Cooling Towers, Vertical Engines. Multiflex Atmospheric Exhaust Relief Valves. Exhaust Gate Valves, Copper Expansion Joints, Dynamometers.

### VACUUM EQUIPMENT

We specialize in Vacuum apparatus for all purposes in the chemical industry.

### RADOJET VACUUM PUMP

We recommend our Radojet Ejector Type Air Pump which uses steam jets for the removal of air and has the following advantages:

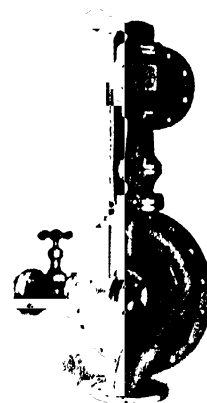
- Low steam consumption
- Extreme simplicity
- Has no moving parts
- Requires no lubrication
- Requires no foundation
- Is noiseless in operation
- Does not require inspection, adjustment or priming
- Requires minimum space
- Is of minimum weight
- Starts quickly
- Gives continuous service
- Requires no attention during operation
- Operates with absolute safety

**Thermal Efficiency**—The Radojet Vacuum Pump has a thermal efficiency of practically 95%. The heat contained in the steam used for compressing the air and vapors is utilized to raise the temperature of the boiler feed water, or process work, the losses due to radiation being practically negligible.

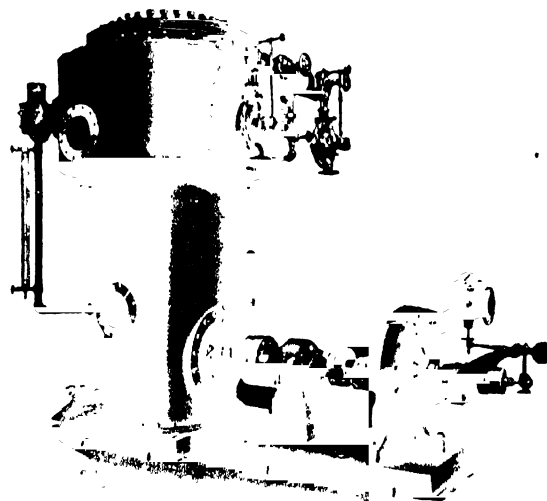
**Simplicity**—Having no moving parts, the Radojet does not have to be oiled, inspected, adjusted or primed; there is no operating expense. No repairs are necessary.

### CONDENSERS

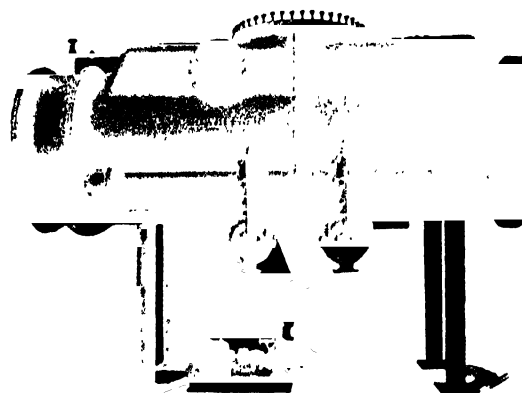
We specialize in the design and construction of condensers and auxiliaries.



RADOJET AIR PUMP



C. H. WHEELER LOW LEVEL JET CONDENSER SHOWING RADOJET EJECTOR AIR PUMPS AND TURBO GEAR DRIVEN REMOVAL PUMPS



SURFACE CONDENSER WITH RADOJET PUMPS AND CENTRIFUGAL CONDENSATE PUMP

# WHITE FUEL OIL ENGINEERING CORP.

Mechanical Fuel Oil Burning Systems  
712 EAST 12TH STREET, NEW YORK, N. Y.

## PRODUCTS

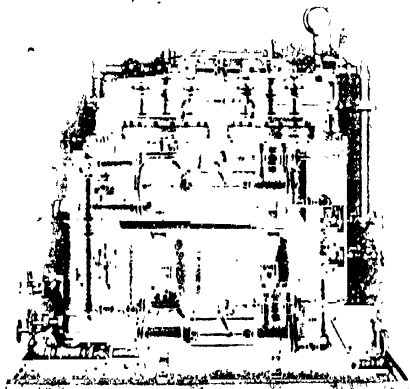
Complete Fuel Oil Burning Systems.

### MECHANICAL OIL BURNING SYSTEMS

Our Systems are the result of numerous experiments in the burning of liquid fuel under boilers by means of mechanical atomization in conjunction with a positive supply of pre-heated air, adequate for complete combustion.

In our Systems atomization is secured by forcing heated oil, under moderate pressure, through a specially designed burner. By its mechanical construction alone the burner pulverizes the oil, so that it issues from the burner-tip in the form of a hollow cone-shaped mist completely surrounded by air. This makes unnecessary any wasteful outside atomizing agency such as compressed air or a jet of steam.

In addition to breaking up the oil into a very fine mist it is equally important to supply air in proper proportion to the oil and in such a way that the air and oil are thoroughly mixed.



OIL HEATING PUMPING AND STRAINING OUTFIT

In our Systems these conditions are well met by patent furnace fronts and an extremely simple arrangement of air-regulating cones. The cones govern the supply of air and the spread of the flame so that the flame commences one inch from the burner-tip and does not exceed three feet in length.

The remaining part of the Systems is the heating, pumping and straining unit. This has been designed and connected so that any part can be cleaned, inspected, or repaired while the system continues in operation. The oil from the storage tanks passes through the suction strainers to the pumps. It is then circulated through oil heaters and discharge strainers under moderate pressure to the burners.

Alteration of the average boiler from coal to oil burning is extremely simple.

### THE TODD MECHANICAL OIL BURNER AND AIR CONTROL

This construction has been designed to permit an exceptionally large range of adjustment of the air and oil control as well as the elimination of direct radiation. It effects complete diffusion of all air entering the furnace, equalizes the pressure and eliminates currents around and to fires.

The burner tip with the combined atomizer and strainer are assembled as a unit. Their construction

prevents improper assembly and they are readily accessible for cleaning or renewal.

The complete front is hinged on a ring plate which is bolted to the furnace front. This gives access to the furnace and also the burner assembly which is swung out with the front when it is opened.



TODD OIL BURNER

The burner connection to oil supply manifold is flexible and will stand pressure of 1000 pounds per square inch. This feature eliminates the dangers of rigid piping and the leaky connections caused by constant making up of joints.

The installation of the front on a boiler or furnace requires no special tools or fittings.

Capacity 100 to 1600 lbs. oil per hour.

The burner is of simple but rigid construction and is designed to atomize the oil, pre-heated to the point of fluidity.

Our burners are obtaining, in every day practise, evaporations of 16 pounds of water from and at 212° F. per pound of oil burned and boiler efficiencies of 80% to 85%, a very marked increase in efficiency over coal.

### HEATERS

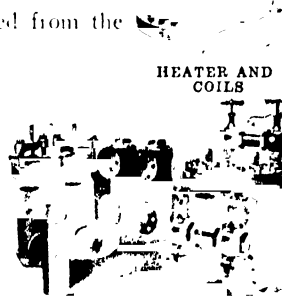
In the burning of fuel oil, the oil is usually heated to temperatures from 150° F. to 300° F. according to the characteristics of the oil used. In the White System the heaters are cylindrical with a header containing stuffing boxes through which the ends of the heating coils pass.



HEATER AND COILS

### STRAINERS

The fuel oil delivered from the wells holds in suspension fine particles of sand and dirt. This foreign matter is caught in the strainer baskets provided in the line of flow between the tank and the burner. Usually two duplex sets of strainers are fitted.



### UNIT OIL HEATING, PUMPING AND STRAINING OUTFITS

Unit outfits are built in sizes from 220 boiler horse-power to 2,500 boiler horse-power. For a great many power plants these unit outfits are used.

# THE WHITLOCK COIL PIPE COMPANY

## HARTFORD, CONN.

149 Broadway, New York  
527 Commercial Trust Bldg., Philadelphia

50 Congress St., Boston  
143 So. Dearborn St., Chicago

OFFICES IN ALL OTHER PRINCIPAL CITIES

### PRODUCTS

**Manufacturers of Coils and Bends of all kinds of Copper, Brass, Iron and Steel Pipe and Tubing.**

**Designers and Manufacturers of Special Steam Heaters for the Heating of Water, Oil, Air and Gases or Liquors of every kind; Coolers for the Cooling of Water, Oil, Air, Gases or Liquors. Also Evaporators, Condensers and Distilling Systems for every purpose.**

### INTRODUCTION

From the very special nature of our product it is impossible to give anything more than a mere outline of its nature and scope. The illustrations in these pages show a few typical styles of coils and a few of the different types of heaters, etc., that we manufacture and the text gives a suggestion of the uses to which they can be applied.

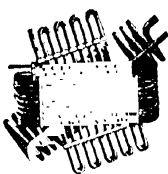


FIG. 61

### COILS

We are prepared to manufacture practically anything in the line of tube and pipe coils. A few uses to which our coils may be applied are the following:

Transformer cooling coils for conducting the cooling water in oil-cooled transformers.

Acid-warming coils for warming the acid in the manufacture of smokeless powder.

Boiling coils for boiling acid, dyes or liquors of any kind by means of steam.

Cooling coils for cooling acids, oils and other liquors by means of water.

Heating coils for heating air or other gases by steam.

Evaporating coils for use in evaporators or stills as in the manufacture of dyes, etc.

Condensing coils for condensing vapors produced by distillation as in the manufacture of essential oils, etc.

Coils in general may be divided broadly into the following classes and sub-classes:

- 1 Helical coils.
  - (a) Plain helical coils
  - (b) Tapered helical coils
  - (c) Double nested helical coils, also triple nested, quadruplicate nested, etc. Fig. 60 shows triple nested helical coils.
- 2 Flat spiral coils.
  - (a) Plain flat spiral coils, Fig. 218
  - (b) Dished flat spiral coils
  - (c) Multiple deck flat spiral coils, Fig. 216
- 3 Oblong or trombone coils
- 4 Square or box coils
- 5 Zigzag coils.
  - (a) Plain zigzag coils
  - (b) Collapsed zigzag coils

There are many other special types of coils which it would take too much space to describe or illustrate, but a few samples may be given. For instance, Fig. 104 shows a cross-section of the manifold for a double-nested helical coil, with the ends connected to a common manifold.



FIG. 216

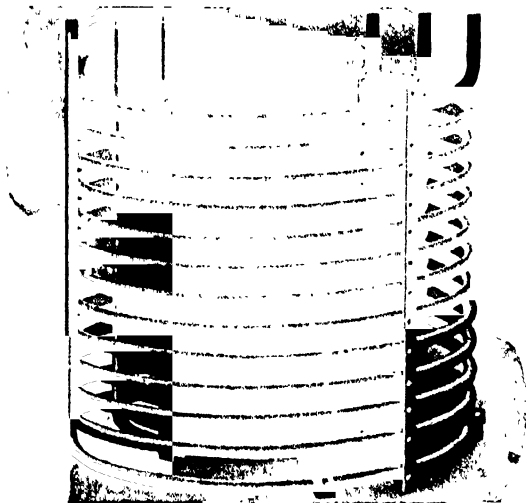


FIG. 60

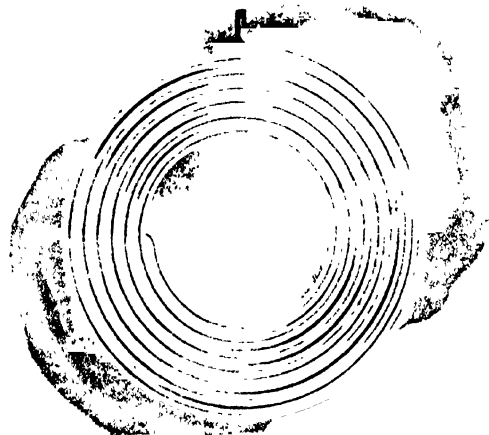


FIG. 218

*Continued on Next Page*



Fig. 216 shows a special multiple nested helical coil made in two sections, with ends connected into headers and the coils alternately double and triple pitch. This coil was designed to heat the liquor in a large vat, by means of exhaust steam. Note that the outer set of coils had to be broken into two semicircular sections to admit of shipment. This coil gives a fairly good idea of our ability to design and build coils to meet a peculiarly difficult combination of conditions.



FIG. 101

We are prepared to submit sketches, specifications, and prices covering coils or bends for any requirements. It is only necessary for you to tell us what you wish to accomplish and we can design and build apparatus to do it.

#### HEATERS, COOLERS, EVAPORATORS, CONDENSERS, SPECIAL APPARATUS

We manufacture several standard types, in various sizes, of the products coming under this heading as well as designing apparatus to meet specific conditions.

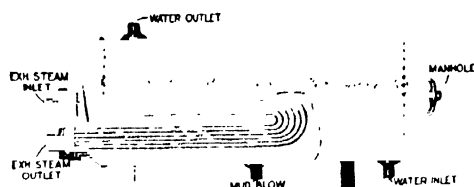


FIG. 14

**Storage Types**—Where conditions require a reservoir of the liquid to be heated or cooled due to sudden or irregular draughts or irregularities in the supply of the heating or cooling medium, a storage type heater or cooler is used. An example of such a situation is

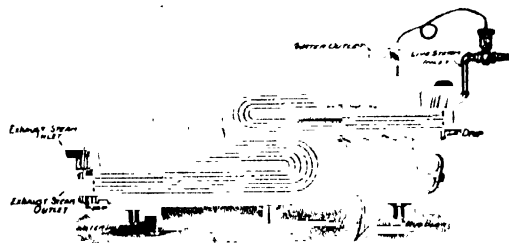


FIG. 137

found in the textile mills where a constant supply of exhaust steam is available to heat process water which is intermittently drawn in large quantities. Under such circumstances a storage heater is required to provide thermal storage for the heat available during periods of rest, so that this heat may be used in the hot water during periods of draught. (See Fig. 14.)

Sometimes several independent heating or cooling units are used in the same vessels, as in the case of the same textile mill, when at times the exhaust steam supply is insufficient, and an automatically controlled supply of live steam is admitted to an auxiliary heating unit contained within the vessel. (See Fig. 137.)

#### Instantaneous

##### Types —

Where the draught on the heater or cooler is steady and the supply of the heating or cooling medium is constant and sufficient, no thermal storage is required and the problem becomes one of effecting a heat transfer from the heating medium, or to the cooling medium, at the highest possible rate. The particular design of heat exchanging device depends upon the exact conditions of service. See Figs. 151 and 152.



FIG. 151



FIG. 152

Variations of the devices illustrated are used in many special processes. For instance, our Type A and B feed water heaters have been adapted, with certain modifications, to such uses as air cooling to cause precipitation and recovery of valuable vapors. See Fig. 50.

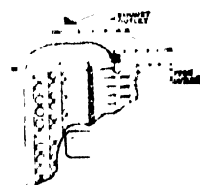


FIG. 50

The adaptation of heat exchanging devices to special heating and cooling processes as well as the selection of a suitable type is always a nice problem in economy. Our excellent facilities for the manufacture of such devices, together with our engineering experience in this necessary selection and adaptation, place us in a position to assist the industries in these problems.

# WHITE METAL MANUFACTURING CO.

Manufacturers of  
Collapsible Tubes and Sprinkler Tops  
HOBOKEN, NEW JERSEY

## PRODUCTS

### Collapsible Tubes and Sprinkler Tops

#### COLLAPSIBLE TUBES

Many products that are manufactured today for the retail trade are being sold in types of containers that are unsuited to the product.

Perfectly good products frequently do not reach their maximum consumption, due principally to the lack of a proper container.

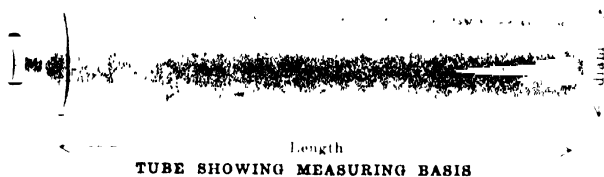
Collapsible tubes are finding an ever widening scope of adaptability to the products of chemical manufacturers who are selling to the retail trade.

These tubes are made in plain or decorated designs, and of varying soft metal alloys or of pure tin.

These tubes can be fitted with a variety of designs of tops.

Some products that are successfully sold in collapsible tubes are:

Adhesives	Antiseptics
Tooth Pastes	Shaving Creams
Vaselines	Flavoring Extracts
Cold Creams	Rubber Cement
Vanishing Creams	Etc



We manufacture all types and varieties of both plain and decorated tubes from  $\frac{3}{8}$ " diameter to  $2\frac{1}{2}$ " in diameter and from  $1\frac{1}{2}$ " in length to 14" in length, in proportion to the diameter.

If you have a product the sale of which you feel could be improved upon by having a better type of container, we would be pleased to have you write us and tell us of your problem. The growth of our business and the large number of satisfied customers we have today indicate that the use of the Collapsible Tube as a container has overcome the most troublesome problem in developing the sales of many products sold to the retail trade.

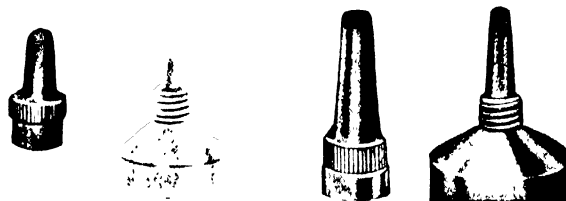
#### CAPS AND OPENINGS

We manufacture all types of caps and openings for the tubes. We will gladly cooperate with prospective customers in making a suitable cap and opening for their tubes. Below are illustrated the openings and caps most commonly used.



RIBBON OPENING, OCTAGON CAP WITH CORK WASHER

ROUND OPENING, ROUND CAP WITH CORK WASHER



EYE TIP TUBE

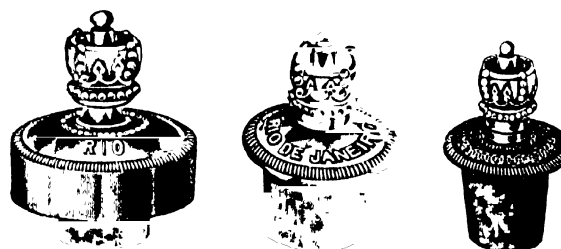
NASAL TUBE



GLUE AND PASTE TUBES

#### SPRINKLER TOPS

We also manufacture a very comprehensive line of Sprinkler Tops for a variety of designs of glass bottles for perfumes and cosmetics. Some of these designs are illustrated below, and can be had in plain, nickel or gold plated finish. We will be glad to cooperate with prospective customers in the design of special styles.



SPRINKLER TOPS (CROWN STYLE)

SEND FOR OUR COMPLETE CATALOGUE OF PRODUCTS

# WILLIAMS PATENT CRUSHER & PULVERIZER CO.

GENERAL OFFICES AND WORKS  
ST. LOUIS, MO., U. S. A.

Chicago Office and Showroom  
1615 Old Colony Building

San Francisco Office and Showroom  
67 Second Street

New York  
Philadelphia

Pittsburgh  
Spartanburg

Detroit  
Richmond

## BRANCH OFFICES

Denver  
Salt Lake

Los Angeles  
Seattle

Montgomery



## PRODUCTS

Crushers and Grinders for all Raw Materials; Coal Crushers; Grinders for Bone, Tankage, Shell and Fertilizer; Shredders for Bark, Chips, etc.

## DESCRIPTION

These machines are constructed on the hinged (loose) hammer principle. They consist of a substantial housing, a rotor comprising the shaft, discs, hammers, set collars, flywheel, driving pulley; breaker plates, cage or grid, and either ring oiling or ball bearings. The material entering the hopper is first crushed or broken on the breaker plate in the front of machine; it then passes on to the cage or grids where it is reduced to the desired fineness, degree of fineness being regulated by the openings between the bars, or by the perforations when perforated metal is used. In some types, particularly those designed for fine grinding, a hand wheel adjustment is provided for maintaining the distance between breaker plates and hammers the same at all times. Close contact is the secret to fine grinding.

## ADAPTABILITY

Whether for crushing, grinding, chipping or shredding; whether you wish to handle soft or hard material, whether a fineness of 100 mesh or a product 2" and under is desired, or a capacity of 100 lbs. or 300 tons per hour, a Williams machine can be found to meet your requirements.

These machines crush coal for stokers, beehive and by-product coke ovens, etc.

They crush limestone in quarries, waste glass for remelting, bone for glue manufacture, etc.

Gypsum, clay, shale and coal can be efficiently ground with Williams machines in cement and gypsum plants.

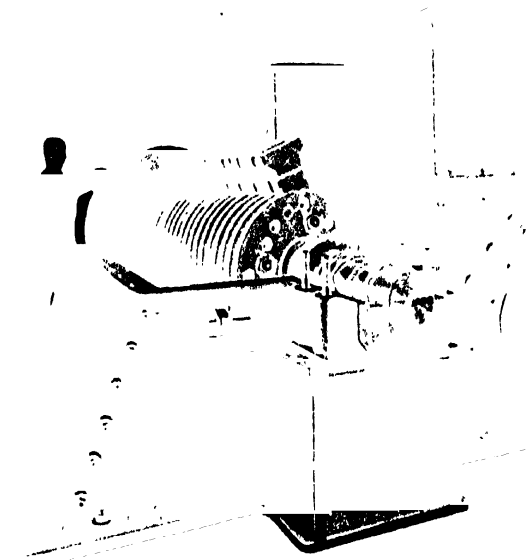
Numerous Williams machines are in use for grinding lime for hydrating or agricultural purposes; chemicals, soap powder, by-products from flour and feed mills, etc.

They shred alfalfa and other hays, Guayule root, pea vine, feathers, bark, roots, chips for tanning or dye extract purposes, old magazines and waste paper, etc., in paper and pulp mills.

If you have any material you wish to reduce from one size to another it can be done in a Williams, if at all.

## ADVANTAGES

The advantages of using the Williams hinged hammer crushers, grinders, etc., may be summed up in four words—**Adaptability, Accessibility, Durability and Reliability.** They are adapted, as already mentioned, to numerous classes of work, either coarse or fine, large or small capacities. They are easily inspected,



MACHINE OPEN SHOWING HAMMERS

parts replaced. It does not require hours of valuable time to open and inspect these machines or to replace parts. They are substantially constructed to withstand the severest strain that may be put on them; foreign material accidentally introduced cannot injure them. In addition they can be depended on; once installed the Williams mills will operate year in and year out, giving the same satisfactory results as the day they were first put in. Williams machines may always be relied upon to help out in time of need.

## LITERATURE

Williams Crushers, Grinders, and Shredders are the most versatile machines manufactured and are adaptable to nearly all materials which it is necessary to reduce—over 600 in number. We have subdivided a few of the most important materials into eight divisions, as per tables below. From this you can specify the catalog desired by number.

NO 23	NO 23 A	NO 23 B	NO 23 C
Limestone Lime Gypsum Coal Others Dry Colors	Shale Clay Asphalt Sand All Clay Material	Tankage Bone Shells Poultry Food and all Fertilizer Material	Oil Cake Linseed Cotton Seed Castor Niter Salt Cake Soy Bean Copra, etc
NO 23 D	NO 23 E	NO 23 F	NO 23 G
Stock Food Cereals Alfalfa and all By Products from Flour Mills	Coal Crushers for Coke Ovens Gas Plants and all Industrial Plants	Shredders for Bark Chips Wood Pulp Licorice Root and all Fibrous Material	Soap Powder All Drug Material Paper Stock and all Chemicals

# WICKWIRE SPENCER STEEL CORPORATION

WORCESTER, MASS.

BUFFALO, N. Y.

Boston

Chicago

DISTRICT OFFICES AND WAREHOUSES

New York

Tulsa, Okla.

Philadelphia

San Francisco

Detroit

## PRODUCTS:

Wire Cloth of any practical metal in a wide variety of meshes, gauges and weaves.

Perforated Metals of every description in a great variety of perforations. Also Perforated Metal Specialties.

Spiral Fabric Conveyor Belt in all lengths, widths and meshes and of any practical metal.

Also: Machine Cast Pig Iron, Steel Billets and Rods, Wire, Springs, Wire Forms, Electrically Welded Fabric for Concrete Reinforcing, Wire Lath, Wire Fencing, Window Screen Cloth, Wire Goods and Specialties.

## MANUFACTURING FACILITIES:

In the space here at our disposal it is possible to describe only a few of the many Wire Cloth and Perforated Metal products we are able to supply for industrial chemical purposes.

The first power loom in the world for weaving wire cloth was introduced by us. We have constantly improved the original type and have now an experience of nearly 70 years in the manufacture of our products. We are able to produce fabrics especially adapted to practically every purpose for which they may be required.

We maintain a large corps of expert inspectors to thoroughly examine every roll of wire cloth on machines expressly designed for that purpose, and all defects are cut out whenever discovered.

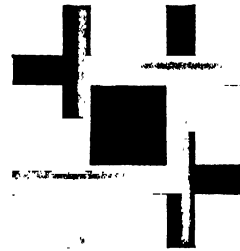
Similar precautions are taken in our Perforated Metal and Spiral Fabric Departments.

## METALS IN WHICH WE CAN SUPPLY WIRE CLOTH:

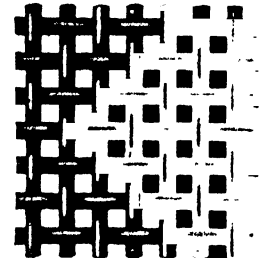
Steel, plain, or—  
(Galvanized)  
(Tinned)  
(Copper Coated)  
(Painted, etc.)

Copper or Brass, plain, or—  
(Tinned, etc.)

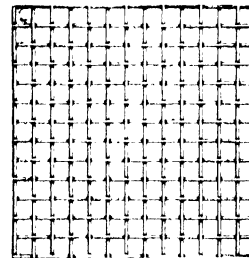
(Nickel) Silver  
Nickel  
Monel Metal  
Phosphor Bronze



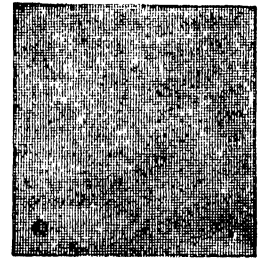
5/8 Mesh. No. 7 Steel



5 Mesh. No. 13 Steel



9 Mesh. No. 22 Steel

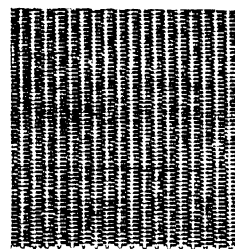


60 Mesh. No. 38 Steel

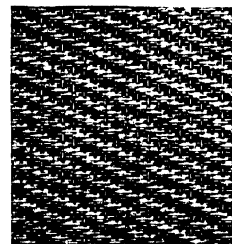
A FEW OF OUR MANY TYPES OF WIRE CLOTH

## FILTER CLOTH:

For filtering water and other liquids requiring the exclusion of minute particles of foreign matter, the special weave herewith illustrated is admirably adapted, as it permits the use of larger wire and closer spacing of same than any other style of weaving, and offers the maximum resistance to heavy hydraulic pressure and wear.



14 X 85 Mesh.  
Nos. 27 32, Dutch Weave



16 X 40 Mesh.  
Nos. 28/27, Dutch Twilled  
Weave

In these fabrics, sometimes described as "Dutch Weave," the filling wires are slightly flattened by being forced and held in close contact with each other, thus the resulting mesh, in this member, is the smallest that can be produced.

*Continued on Next Page*

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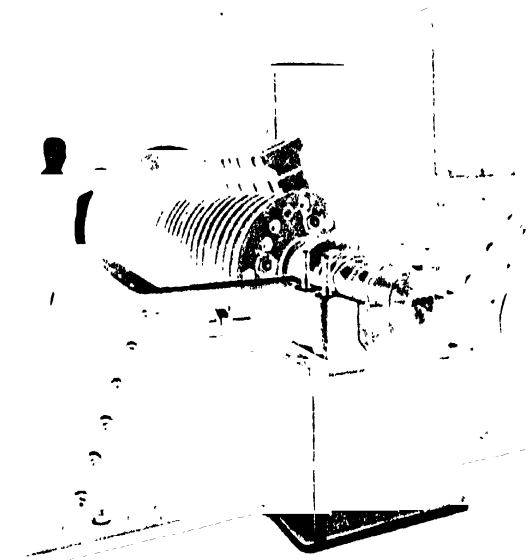
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MACHINE OPEN SHOWING HAMMERS

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## THE WILL CORPORATION

Laboratory Apparatus, Glassware, Chemicals  
845 MAPLE STREET, ROCHESTER, N. Y.

Cable Address  
WILLCORP, Rochester

### PRODUCTS

Asphalt Testing Apparatus  
Autoclaves  
Bacteriological Apparatus  
Balances and Weights  
Biochemical Testing Apparatus  
Blood Testing Apparatus  
Blowers  
Burners  
Calorimeters  
Cement Testing Apparatus  
Centrifuges  
Chemicals  
Colorimeters  
Crushing Apparatus  
Distilling Apparatus  
Electrolytic Analysis Apparatus  
Extraction Apparatus  
Filter Paper  
Furnaces, Electric and Gas  
Gas Analysis Apparatus  
Glassware  
Grinding Apparatus  
Hardware, Laboratory  
Hot Plates  
Hydrogen-ion Apparatus  
Hydrometers  
Metallographic Apparatus  
Microscopes and Accessories  
Microtomes and Accessories  
Milk Testing Apparatus  
Motors  
Nitrogen Determination Apparatus  
Oil Testing Apparatus  
Ovens, Electric and Gas  
Photomicrographic Apparatus  
Polariscopes  
Porcelain Ware  
Pulverizing Apparatus  
Pyrex Glassware  
Reagents  
Refractometers  
Resistance Glassware  
Saccharimeters  
Serological Apparatus  
Shaking Apparatus  
Silica, Fused  
Spectroscopes and Accessories  
Spectrographs  
Spectrometers  
Spectro-Photometers  
Sphygmomanometers  
Stains, Bacteriological and Biological  
Syringes  
Tar Testing Apparatus  
Thermometers  
Urine Analysis Apparatus  
Vitresil  
Water Analysis Apparatus  
Water Baths  
Water Stills

### ABRIDGED CATALOG

In the following pages, we are presenting an abridged catalog on laboratory apparatus, which, while quite comprehensive in scope, covers only the more commonly used types of equipment. Practically all material is arranged in alphabetical sequence except for several well-defined groups, as for example, **Asphalt-Testing, Cement-Testing, Balances and Weights, Oil-Testing, etc.** Accessories are, in some cases, listed with the particular item with which they are to be used. As a general rule, products are listed under that word of the name which indicates the use, as, for instance, "Flexible Metallic Tubing" will be found under "Tubing" and not under letter "F" or "M."

We offer not only these materials as listed, but, comprehending your exact needs, we are in a position to supply promptly any type of apparatus or equipment required.

We are able to advise you as to the type and capacity of apparatus required for any stated purpose or to arrange a list of equipment in proper quantities for your own particular requirements.

### POLICY

Our business is conducted with the view of rendering with each transaction a service that will strengthen the confidence of our clients and will form a basis of a mutually pleasant and valuable relationship.

It is our aim to supply equipment of high quality only and to maintain in stock at all times such items as are here being listed so that immediate delivery can be made.

### SERVICE

Since our previous representation in this Catalog, we have kept pace with the advances made in the field of laboratory apparatus and equipment. We have added to our existing line a number of specialties so as to be able to supply promptly anything required by the chemist or technologist in his routine, special or research work.

Our staff includes experts in the several chemical lines whose knowledge and experience are available at all times. We will gladly supply our disinterested opinion upon any piece of equipment without regard for the source and will recommend the particular apparatus best suited for the purpose in hand.

We would be pleased to assist in the development of new equipment or in the standardization of sizes and quality of materials and shall welcome, at all times, inquiries along these lines.

### RESEARCH

We maintain well-equipped laboratories for the production of laboratory chemicals, biological dyestuffs, indicators and rare organic compounds. Special volumetric test solutions can be made up with a high degree of accuracy and the ordinary volumetric solutions are maintained in stock and periodically checked to insure absolute accuracy.

### CHEMICALS

We carry in stock a complete line of reagent chemicals and prepared reagents. These include the products of the J. T. Baker Chemical Company, Merck and

*Continued on Next Page*

Mallinckrodt. Special biochemical and clinical reagents, dyestuffs and stains prepared in our own laboratory are immediately available and their quality is guaranteed without reservation.

We have developed on a commercial scale the production in our own laboratories of superior grades of several chemicals, among which can be listed the following:

Acetamide	Neutral Red
Azolitmin	Purified Litmus
Benzidine	Picramic Acid
Carmine Acid	Soda Lime
Malic Acid (Natural)	Sulfoevanates
	Titanium Trichloride

These we are prepared to furnish promptly from stock and we solicit your inquiries.

#### GLASS-BLOWING

We have enlarged our glass-blowing department so that its facilities and expert personnel permit of the accurate production of any piece of glass apparatus from sketch, blueprint or submitted samples. We would be pleased to present at any time estimates on the probable cost of making up any special glass apparatus in which you are interested.

#### STANDARDIZATION

We have constantly aimed to standardize equipment, reagents and chemicals used in laboratory work and will gladly further any movement along these lines. The idea of standardization will dominate in our policy and we feel sure that, as time progresses, more and more uniformity of our products will result. We have already complied with the suggestions made by the committee upon standardization and apparatus of the American Chemical Society and can furnish reagent chemicals in the metric system unit sizes according to its specifications.

#### PUBLICATIONS

As our exceedingly comprehensive stock of glassware includes all types and sizes used in chemical, biological and allied laboratories, it was thought advisable to publish a special Glassware Catalog in which are also included American made porcelain, silica ware and gas analysis equipment.

A very comprehensive Bacteriological Catalog, embracing the biochemical and pathological field, has also been published. This is a 600-page book, 7" x 10" in size, and covers this field in a more complete manner than has ever been previously attempted. Due to the limited edition of this catalog, its distribution is necessarily restricted.

A special treatise on Water Stills has been published in the form of a pamphlet of 44 pages, in which all of the standard makes of Water Stills are carefully described and analyzed in detail. This covers Stills operated by electricity, gas, steam, gasoline and kerosene.

Our Bulletin 100, covering our new Elliott "Ion-O-Meter," is now available. It is descriptive of a new type of Hydrogen-ion equipment that is by far the simplest in construction and, at the same time, of as high accuracy as any existing equipment of this character.

In addition to the above we distribute reprints, circulars and bulletins on various other subjects that are available to all interested.

Requests for literature pertinent to your field of activity will be promptly complied with. Where desired, we will gladly place your name on our mailing list for the regular submittal of future publications that will be issued by us.

#### PRICES

Prices listed include the cost of packing f. o. b. Rochester and are subject to change without notice, depending upon market fluctuations.

With the approach to a more normal condition, as regards the costs of labor and raw materials, a decline as compared with former prices has been anticipated and considered by us in our present calculations. And, inasmuch as a downward tendency exists, we shall continue to observe developments in this direction in a most thorough manner, with a view of granting to our patrons in all cases the benefit of whatever further price reduction will occur.

**Whether estimates are asked for or not, the same price extensions will apply, without discrimination,** and in this as well as in all other respects, the interests of our clients will be properly safeguarded.

#### TERMS

When ordering from this Catalog, please give catalog number, name of article and size desired. Specific information should be given in ordering accessory parts and in stipulating the current and voltage in the case of electrically equipped apparatus.

#### CREDIT AND FINANCIAL STANDING

To avoid delay, purchasers with whom we have no account and who have no mercantile rating, should accompany their first order with commercial references or remittance in cash, money orders, or New York or Chicago current funds, as a local check may be subject to collection charges. A 25% deposit should accompany all C.O.D. orders.

#### LIABILITY

In packing we triple-check all goods and obtain proper receipts from transportation companies. Unless otherwise specified, we shall use our best judgment in mode of shipping, prepaying transportation if requested and adding the amount to invoice. Due to our careful packing and checking, very little breakage or shortages occur. Shipments are insured and **if breakage or damage of any other character does occur the customer is guaranteed against loss**, but is urgently requested to immediately advise us, accompanying his report with detailed statement so that a formal claim may be entered by us against transportation company. Credit will be issued to cover this loss or a replacement made at the customer's option. As claims for shortages are frequently made, due to too casual inspection of the packing, we suggest a minute examination of all packing materials for small items.

#### GUARANTEE

We exercise the utmost care in manufacturing and packing. In case of faulty goods inadvertently reaching our customers, we shall feel under obligation if our attention is called thereto.

#### RETURN OF GOODS

Goods being returned for any reason should be plainly tagged with the sender's name and address. Special identification tags are furnished on request. Wherever possible, please give date of invoice on which the goods were originally billed.

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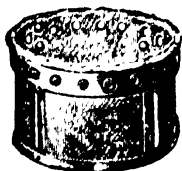
## LABORATORY APPARATUS

**C-10005 Acid Pots**—Of an acid-resistant stoneware, very desirable in the larger sizes for waste jars in laboratories

	No.	B	C	D	E
Capacity, liters	8	12	16	20	
Each	1.10	1.65	2.00	2.50	
	No.	F	G	H	
Capacity, liters	24	30	40		
Each	2.90	4.50	5.25		



C-1015



C-1165

**C-1015 Adapters—Curved**—Of heavy glass, for connecting retorts with receivers

	No.	A	B	C	D
Length, mm	150	180	200	250	
Diameter, mm	18	25	32	38	
(Inside large end)					
Each	.17	.18	.23	.27	

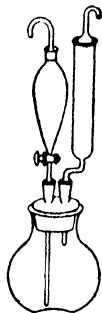
**C-1020 Adapters—Straight**—Sizes and prices same as No. C-1015.

**C-100 Air Baths**—Of asbestos reinforced and ventilated, round for flasks

	No.	A	B	C
Diameter, in	3½	4½	5½	
Each	1.25	1.50	1.80	



C-1130



C-1135

**C-1130 Alkalimeters—Knorr's**—For the determination of carbonic acid in carbonates, as recommended by the Association of Official Agricultural Chemists, all joints ground together

Each ..... 9.00

**C-1135 Alkalimeters—Mohr's—New Model**

Each ..... 4.50

**C-101 Aprons**—For use in laboratory; of good quality rubberized material, waterproof and resistant to most chemical reagents, size 34" x 45"

Each ..... 1.50

**C-102 Aprons**—For laboratory work. Black rubber-coated, back of fine black and white checked cloth particularly desirable for domestic science work

Of good quality; size 24" x 36".  
Each ..... .60

Prices subject to change without notice



C-1165

**C-1165 Aquaria**—High form, of heavy, clear, white glass, with ground rim and groove near top

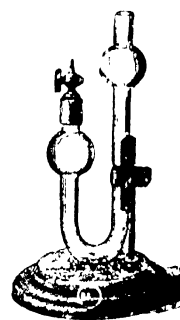
	No.	A	B	C	D	E	F
Capacity, gal.	1½	1	1½	2	3	4	
Height, in	5	6	8	8	9	10½	
Diameter, in	6	7	8½	9	10	11	
Each	.90	1.25	2.75	3.50	5.40	6.80	
	No.	G	H	I	J	K	
Capacity, gal.	5	6	8	10	12		
Height, in	11	12	13	14	15		
Diameter, in	12	13	14	15	16		
Each	7.70	10.00	13.25	15.50	18.25		

**C-1170 Aquaria**—Low form, of heavy, clear, white glass; with ground rim and groove near top

	No.	A	B	C	D	E	F
Capacity, gal.	1½	1	1½	2	4½	8½	
Height, in	4½	5	5½	6½	8½	9½	
Diameter, in	7	8	9	10	14	17	
Each	1.65	2.00	2.35	3.00	5.60	13.20	



C-1180



C-1185

**C-1180 Arsenic Apparatus—Gutzeit-Bragg's**—With all ground joints

Each ..... 1.75

**C-1185 Arsenic Apparatus—Marsh's**—For the detection of arsenic, complete with brass stopcock

Each ..... 3.50

**C-1190 Arsenic Apparatus—Marsh's**—Glass parts only

Each ..... 2.75

**C-10310 Asbestos Board**—Fire and acidproof, in sheets 1 meter square

	No.	A	B	C	D
Thickness, mm.	75	15	2.25	3	
Weight, kilos	75	2	2.50	3.50	
Per lb.	.35				

	No.	E	F	G	H
Thickness, mm.	5	6	9	12	
Weight, kilos	5	7	10.5	14	
Per lb.	.35				

**C-10335 Asbestos Mittens**—Fire and acidproof.

Per pair ..... 4.00

**C-10365 Asbestos Paper**—Extra thin; in sheets, 225 x 350 mm.

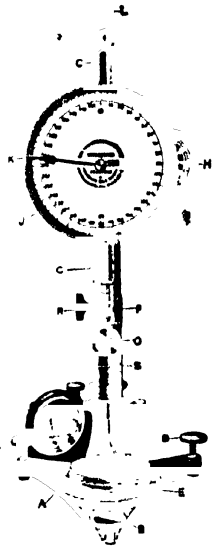
Per lb. .... .35

Asbestos cement, cloth, cord, wood, wool, and metal bound mats can be supplied.

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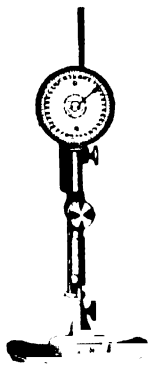


APPARATUS FOR TESTING ASPHALT AND  
OTHER BITUMINOUS MATERIALS



C-105

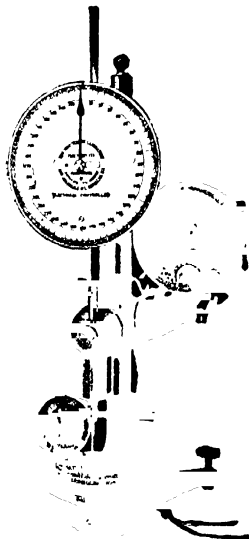
**C-105 Penetrometer — New York Testing Laboratory Type**—For determining the consistency of asphalt cement or similar material by determining the depth to which, under a definite load and during the given time, a standard needle will penetrate. A stopclock attachment fixed to the standard measures the time while depth of penetration is measured in tenths of a millimeter on dial. Supplied with adjustable weights which permit of use of a 50, 100, or 200 gram load upon the needle as desired, with instructions for use.  
Each . . . .Net 112 50



C-107

**C-107 Penetrometer — Miniature Size**—Similar to No. C-105 above, but of about one-half size permitting of greater portability. Needle and bar are standardized to 100 grams using the same needle as in the larger instrument.  
Each . . . .Net 56 50

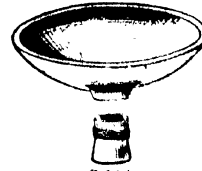
**C-108 Extra Needles for use with the above**  
Each . . . .Net .60



C-110

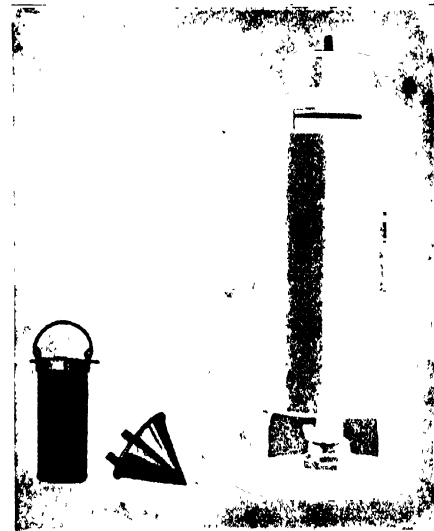
**C-110 Penetrometer — New York Testing Laboratory Type**—Electrically controlled. For operation on 110-volt D.C. lines or with six dry cells of 20 to 25 ampere capacity each. This instrument entirely eliminates the personal equation and gives accurate penetration at each test. Cannot be used on alternating current except through a rectifier.  
Price on application

**C-112 Penetrometer**—Same as above, but for alternating current with rectifier.  
Price on application



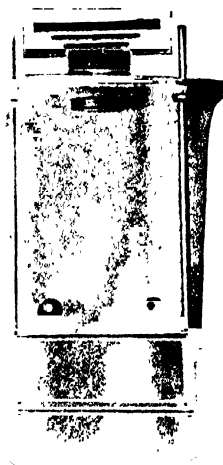
C 114

**C-114 Asphalt Viscosimeter** for controlling the consistency of bituminous binders, float made of aluminum, with three brass plugs, standardized.  
Each . . . . .Net 16.50  
**Crucible-Porcelain** for determination of soluble bitumen, see under "Crucibles"



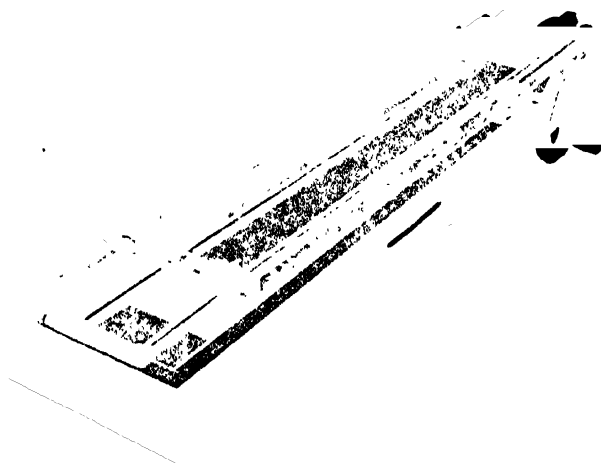
C 116

**C-116 Extractor—New York Testing Laboratory Type**—For the extraction of bituminous material from paving mixtures containing broken stone. Consists of a metal cylinder inside of which fits a second cylindrical inner vessel which holds the following: wire basket holding sample of disintegrated paving material is suspended in inner vessel, inverted conical condenser with outlets for water circulation acts as top; heated by 16 CP carbon filament incandescent lamp and mounted on wooden base.  
Each . . . . .Net 61.75



C-119

**C-119 Ring and Ball Apparatus** Standard method for determining the softening point of bituminous materials other than tar products according to ASTM. Furnished complete with thermometer and glass beaker of 600 cc. capacity.  
Each . . . .Net 17.75



C-121

**C-121 Ductility Machine—Smith's**—Improved form for hand power with stone trough heavily enameled both inside and out, arranged for 110 cm pull and for three briquets

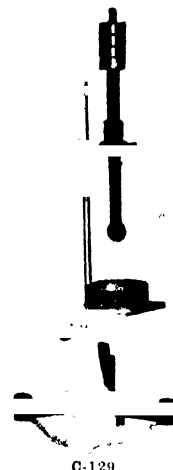
Each ..... Net 281.00

**C-123 Ductility Machine—Smith's**—Improved form very similar to above, but electrically driven with direct connected motor for 110-volt direct current

Each ..... Net 306.00

**C-124 Ductility Machine—Smith's**—Same as above, but for 110-volt alternating current

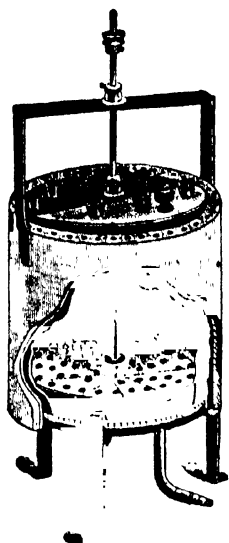
Each ..... Net 356.00



C-129

**C-129 Adhesion Machine—Kirschbraun**—For measuring comparatively the adhesive strength of asphalt as a binder for mineral conglomerates in the construction of roads and pavements. Apparatus is attached to a support with double scale dynamometer reading to 250 grams in 10 gram divisions, a system of gears presses the sample against the ball and then removes it, scale records the adhesive pull under various conditions of speed and temperature. Complete with two sample cups and directions.

Each ..... Net 30.00



C-126

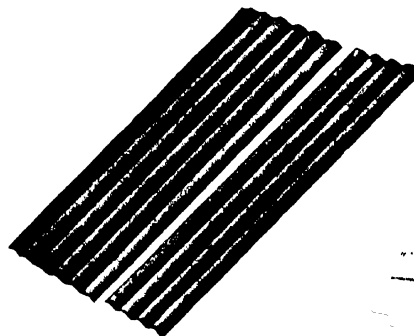
**C-126 Oven—New York Testing Laboratory Type**—Heated by ring burner underneath the space between the oven proper and the outside wall; fan mounted on ball-bearings which can be revolved by any convenient power hastens drying; made of Russian iron covered with asbestos, without thermometer.

Each ..... Net 37.50

**C-127 Oven**, same as No. C-126 above, but of copper.

Each ..... Net 45.00

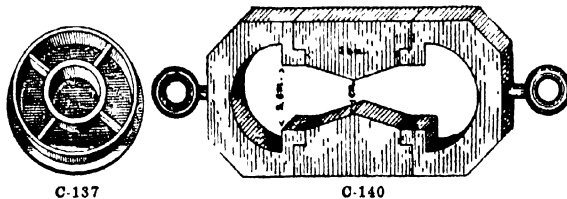
Prices subject to change without notice



C-134

**C-134 Asphalt Flow Plates**—Set consists of two each, with six corrugations and one mould

Per Set ..... Net 6.50



C-137

C-140

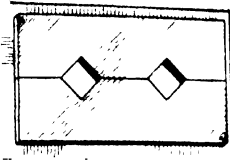
**C-137 Bitumen Holder, Brass—Draper type.**

Each ..... Net 4.50

**C-140 Briquet mould for asphalt.**

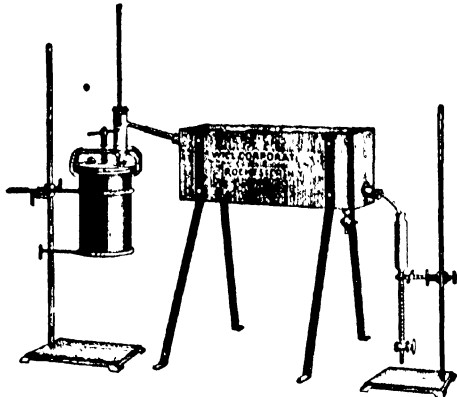
Each ..... Net 7.50

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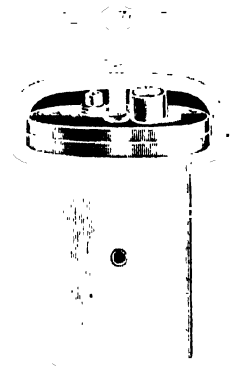
C-144

- C-144 Cube Mould—For bitumen,  $1\frac{1}{2}$ ", with plate  
Each ..... Net 6.00



C-150

- C-150 Dehydrating Apparatus—For tars and creosote oils—  
Used by The Barrett Co., and adopted as standard by A S T M, consists of copper still 6" x  $3\frac{1}{2}$ " with steel clamps on proper supports with ring burner, copper condensing trough, connecting tube, separatory funnel, support and clamp but without thermometer  
Each ..... 43.50



C-155-B

- Separate parts for No. C-150 above
- C-155 Still—Of heavy copper with steel clamp, inside dimensions 6" x  $3\frac{1}{2}$ " with tubulated cover for connecting tube and screw clamp  
Each ..... 19.50
- C-156 Still—Same as No. C-155 above, but with inside dimensions  $7\frac{1}{2}$ " x 5".  
Each ..... 25.50
- C-159 Ring Burner—For small size Still No. C-155.  
Each ..... 2.55
- C-160 Ring Burner—For large size Still No. C-156.  
Each ..... 3.00
- C-163 Connecting Tube—Small size, glass  
Each ..... .50
- C-164 Connecting Tube—Large size, glass  
Each ..... .60

Prices subject to change without notice

- C-166 Condenser Trough—Of heavy copper on support without condensing tube  
Each ..... 15.50

- C-168 Condenser Tube—Of glass, about 22" long  
Each ..... .40

- C-170 Separatory Funnel—For water and tar with stopcock and glass stopper, capacity 120 cc., stem graduated 20 cc. in 1-10 cc.  
Each ..... 4.00

- C-173 Thermometer—For use with No. C-150, graduated from 0°-100°C. in single degrees  
Each ..... 3.00



C-175

- C-175 Dish—Evaporating—With handle, made of pure sheet metal, 2 $\frac{1}{4}$ " diameter  
Each ..... 2.25



C-178



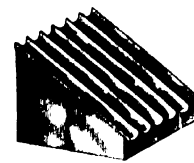
C-180

- C-178 Air Melting-point Oven—With two mica windows and removable tray, of copper  
Each ..... 10.00

- C-180 Penetrometer—Schutte—Of brass with brass plug  
Each ..... 4.70



C-182



C-184

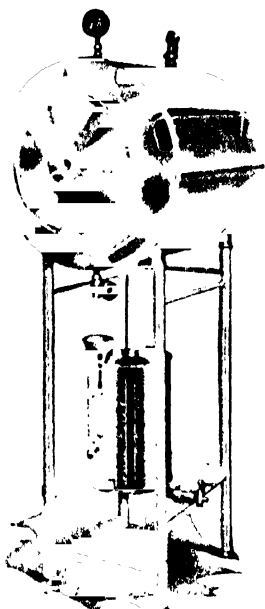
- C-182 Pitch Mould—Of brass with iron clamps and brass block, for  $\frac{1}{2}$ " cubes  
Each ..... 6.00

- C-184 Slide Box—Of polished copper with six corrugations  
Each ..... 5.00

Additional equipment of a general nature for use in the testing of Asphalt and Cement can be found under various captions throughout the body of the Catalog, and several items of interest will also be found under the section on Cement Testing Equipment. Practically all equipment recommended by the American Society of Testing Materials can be supplied, and we solicit your inquiry.

Continued on Next Page

## AUTOCLAVES



C-10375

**C-10375 Autoclaves, Eclipse—With Horizontal Chamber—** Cylindrical in form, differing from ordinary steam pressure sterilizer principally in method of jacketing, made of heavy, polished copper, with double wall, inner door of solid, cast brass, rolling on track inside instrument, each autoclave fitted with interior shelf, water gauge, pressure gauge and safety valve, and mounted on white enameled iron stand as illustrated, either gas, steam, petroleum, acetylene gas or other fuel may be used for heating, and method to be employed should be stated when ordering, autoclave may be used as ordinary free steam sterilizer by leaving air-cock open, which will prevent accumulation of steam and maintain a temperature of 100°C

No.	A	B	C	D	E
Length, inside, cm . .	80	71	61	51	41
Diam., inside, cm. . .	63	56	51	41	32
Diam., Door Opening, inside, cm . .	41	35	30	25	20
Each . . . . .	416.00	313.00	262.00	220.00	180.00
Boxing, extra . . . . .	12.00	12.00	10.00	10.00	10.00

**C-10380 Autoclaves, Eclipse—With Horizontal Chamber—** Same as No. C-10375 above, but nickel-plated

No.	A	B	C	D	E
Length, inside, cm . .	80	71	61	51	41
Diam., inside, cm. . .	63	56	51	41	32
Diam., Door Opening, inside, cm . .	41	35	30	25	20
Each . . . . .	447.00	338.00	280.00	235.00	190.00
Boxing, extra . . . . .	12.00	12.00	10.00	10.00	10.00

**C-10385 Autoclaves — With Riveted Boiler—** Designed for sterilization under steam pressure, boiler made of heavy, polished copper, tin-lined, with spun bottom and provided with perforated tray having two shelves, lid of cast brass, nickel plated and fitted with ground joint, no washers being required to make it steam-tight, hinged lid is supplied on every apparatus of the larger size and is optional on the small sizes, provided with pressure gauge, thermometer and safety valve and tested and guaranteed to withstand pressure of 35 lbs. per square inch, supplied with either gas or electric equipment, as indicated; for gas heating a larger burner is provided; for electric equipment be sure to state voltage and current when ordering.

Prices subject to change without notice

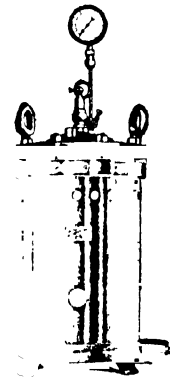


C-10385

No.	A	B	C	D	E	F
Gas	Gas	Electric	Gas	Electric	Gas	Electric
With hinged lid	With hinged lid	Lid not hinged	Lid not hinged	With hinged lid	With hinged lid	With hinged lid
Depth, inside, cm . . . . .	67	67	60	60	60	60
Diam., inside, cm . . . . .	35	35	28	28	28	28
Extreme height, incl base cm . . . . .	115	115	110	110	110	110
Each . . . . .	126.00	196.00	91.00	144.00	98.00	151.00

**C-10390 Autoclaves — With Riveted Boiler—** Same as No. C-10385 above, but nickel-plated

No.	A	B	C	D	E	F
Gas	Gas	Electric	Gas	Electric	Gas	Electric
With hinged lid	With hinged lid	Lid not hinged	Lid not hinged	With hinged lid	With hinged lid	With hinged lid
Depth, inside, cm . . . . .	67	67	60	60	60	60
Diam., inside, cm . . . . .	35	35	28	28	28	28
Extreme height, incl base cm . . . . .	115	115	110	110	110	110
Each . . . . .	133.00	203.00	98.00	151.00	105.00	158.00



C-190

**C-190 Autoclave—**This chemical digester consists of a boiler of seamless drawn steel with 5/16" wall to which is threaded and welded a heavy cast-iron collar. A cast-iron cap is accurately fitted with packing-joint and clamped to the pot by means of six heavy steel stud bolts. A pressure gauge and blow-off valve are provided together with an auxiliary safety valve to be used for pressures up to 250 lb per square inch. Thermometer well is sunk through cap to within one inch of bottom. Apparatus tested hydraulically to 1000 lb per square inch. Heated by high-power gas burner; with polished steel jacket.

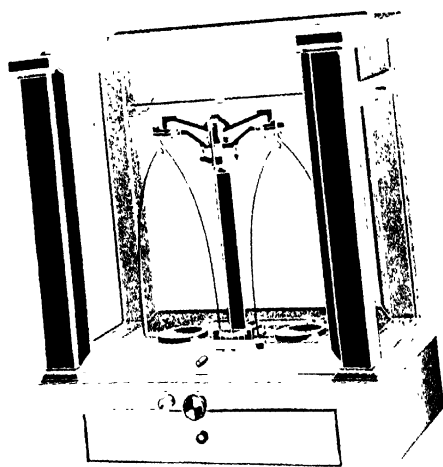
No.	A	B	C
Diameter, in. . . . .	6	8	10
Depth, in. . . . .	12	12	12
Each . . . . .	Net 150.00	175.00	195.00

Continued on Next Page

# THE WILL CORPORATION

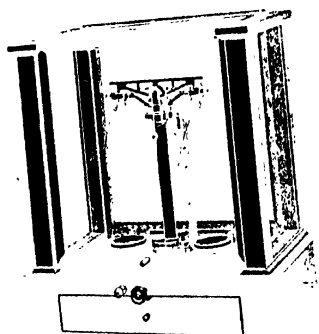
## BALANCES AND WEIGHTS

The balances listed represent but a small number of those that can be furnished, but limited space demands that but a representative selection be shown. All standard makes of American balances can be supplied, the larger number of which are maintained in stock for immediate delivery. We will be pleased to submit complete information on any balance or special scales that you may require.



C-10410

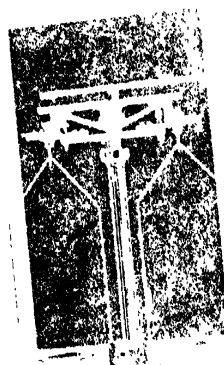
- C-10410 Balance, Analytical—Becker's**—Capacity, 200 grams—sensitiveness, 1/10 mg.; diameter of pans, 3 in.; length of beam, 6 in.; bearings, agate, knife-edges, agate, aluminum beam graduated in 1/10 mg. with white graduations on black background, independent arrest for pans with automatic stop, width of pan support, 4 in. (wider if specified), polished mahogany and glass case, dimensions of case: 16 1/4 in. long, 9 in. wide, 8 1/2 in. high, mounted on plate glass base.  
Each ..... Net 110.00
- C-10415 Balance, Analytical—Becker's**—Same as No. C-10410 above, but without plate glass base.  
Each ..... Net 100.00



C-10417

Prices subject to change without notice

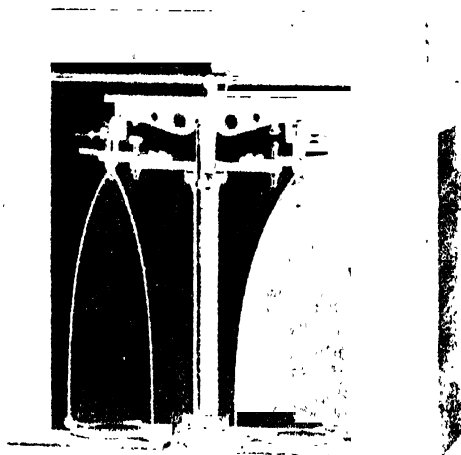
- C-10417 Balance—Analytical—Becker's Chainomatic**—Capacity 100 gm. with sensitiveness of 1/20 gm. Specifications same as No. C-10410 except for chainomatic feature. Capacity of bar and vernier 50 mg. to 1.10 mg. Mounted on plate glass base.  
Each ..... Net 150.00



C-10420

- C-10420 Balance, Analytical—Volland's Senior Model**—Capacity, 200 gm. in each pan, sensitiveness, 1/10 mg. under full load; knife edges and bearings of finest Russian agate, accurately ground; beam, specially hard rolled aluminum, 6 in. long, graduated center (zero point) to each end, in white inlaid on black background; hangers, 4 in. wide, pans, 2 1/2 in. in diameter, triple beam arrest with drop movement, rider carrier operates over entire beam without obstruction, and patented rider hooks prevent rider from dropping back on shank of hook; column base, circular with two vial levels always in view of operator; red graduated index plate above column base has black pointer tip, red graduations having been proved to be most easily read, as established by the U. S. Government, which now insists on red graduations, case, of mahogany with sliding doors, the front counterpoised, the rear removable; 4-in. space in front of column base accommodates set of weights inside case, mounted on plate glass base.  
Each ..... Net 100.00
- C-10425 Balance, Analytical—Volland's Senior Model**—Same as No. C-10420 above, but without plate glass base.  
Each ..... Net 92.00
- C-10430 Balance, Analytical—Volland's Professional Model**—Same as No. C-10420 above, but adjusted to sensitiveness of 1/20 mg., mounted on plate glass base.  
Each ..... Net 110.00
- C-10435 Balance, Analytical—Volland's Professional Model**—Same as No. C-10430 above, but without plate glass base.  
Each ..... Net 102.00

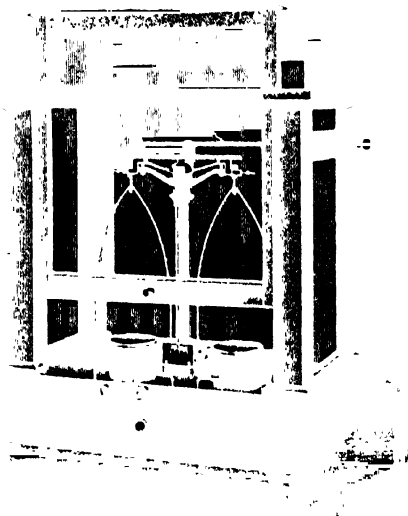
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C-10440

**C-10440 Balance, Analytical—Volland's Junior Model** Especially suitable for quantitative analysis in the educational laboratory, because of its accuracy, durability and quick action, combined with reasonable price, capacity, 200 gm. in each pan, sensitiveness, 1/10 mg. under full load, knife-edges and bearings of agate; beam of aluminum, right arm graduated into 1/5 mg., in white inlaid on black background; hangers, 7 1/4 in. high and 4 1/4 in. wide, pans, 2 1/2 in. in diameter, arrest supports, beam and hangers with freedom from contact between edges and bearings, release by single action, making contact of center and end knives with bearings simultaneous, self-locking pan arrests with adjustable push-button, rider-carrier runs in support above column in addition to side wall opening, patented rider hook prevents rider from dropping back on shank of hook, plummet suspended at back of column with adjusting point for leveling, red graduated index plate above column base at front has black pointer tip, red graduations being most easily distinguished and now demanded by the U. S. Government, case of mahogany, with counterpoised front door.

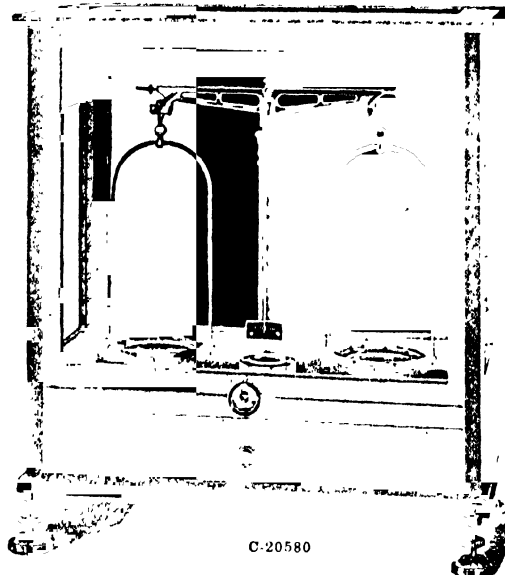
Each ..... Net 48.00



C-10442

**C-10442 Balance, Analytical—Junior Model—Capacity 200 gm. sensitiveness 1/10 mg.** Edges and bearings of agate. Beam of aluminum, 6 in. with graduations both sides of center. Hangers 4 1/2 in. pans 3 in. Drop arrest and double rider carrier. Level at base of post. Finely finished case with drawer.

Each ..... Net 60.00



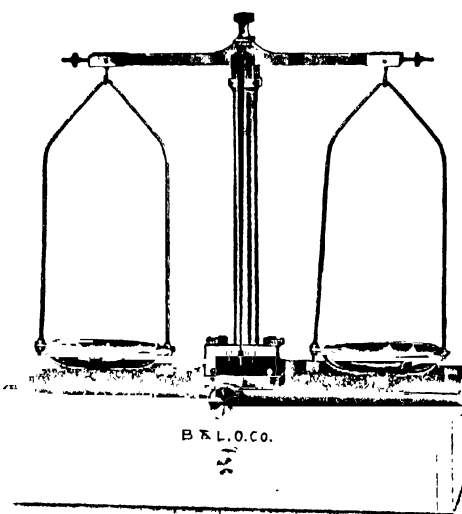
C-20580

**C-20580 Balances—General Laboratory**—Especially adaptable to secondary schools and for elementary college work, and will likewise be found very useful in industrial laboratories where weighings requiring a fairly high degree of accuracy are required, sensitiveness 2 mg. under full load, capacity 100 grams, beam 200 mm. with adjusting screws at both ends; eccentric beam lifting device; plumb-bob for leveling, mounted in rear of post, 3 leveling screws for balance rests, bows 90 mm. wide, pans 80 mm. diameter; case of French mahogany with glass sides and top and with sliding doors in both back and front, finished in highly polished brass, lacquered, with agate bearings.

Each ..... 27.50

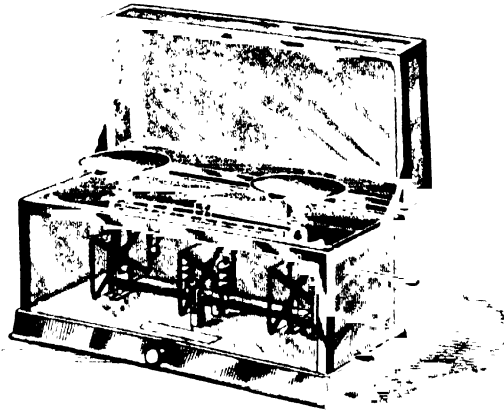
**C-20582 Balances—General Laboratory**—Same as No. C-20580, but with steel bearings instead of agate.

Each ..... 25.00



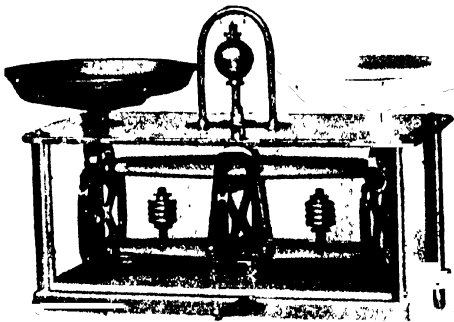
C-20858

- C-10658 Balance, Chemical—Sensitivity, 1 gm. Length of beam 150 mm. Made of brass heavily lacquered. Has eccentric lift. Mounted on base with drawer.  
Each ..... Net 14.00



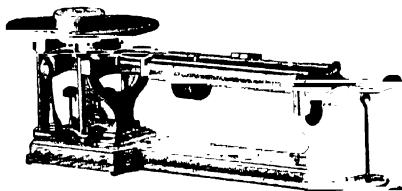
C-10445

- C-10445 Balance, Torsion—Prescription Model—Capacity, 120 gm.; sensitiveness, 2 mg.; pans of German silver, 75 mm. in diameter, rider beam graduated on upper edge from  $\frac{1}{8}$  to 8 grains and on lower edge from 5 mg. to  $5\frac{1}{2}$  decigrams, in glass case with cover.  
Each ..... Net 60.00



C-10447

- C-10447 Balance—Torsion Glass Box Scale—Capacity 4½ kilos or 10 pounds, sensitiveness 1/15 gm. Brass pans, nickel plated, 8 in. diameter. Arrest for quick weighing.  
Each ..... Net 65.00



C-10460

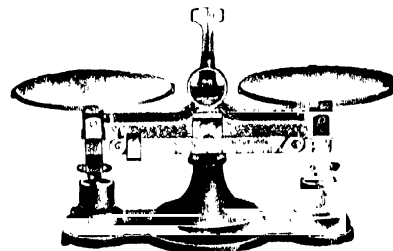
- C-10460 Balance, Solution—Troemner's—Designed for weighing liquids with accuracy; capacity, 20 kilos, sensitiveness, 1 gm.; two weighing beams and sliding poises, one divided into 100 parts, each of which represents 1 gm.; other beam divided into 10 parts, each representing 1 gm.; a bar with sliding poise is placed under the weighing beams for balancing the empty containers.  
Each ..... Net 75.00

Prices subject to change without notice



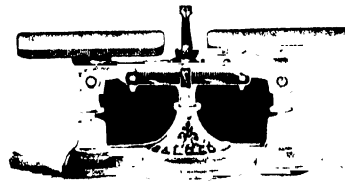
C-10467

- C-10467 Balance—Laboratory Scale—On iron base with nickel plated pans, upright indicator and ivory index, regularly furnished with steel bearings and brass weights. Weights set in block integral with base, capacity 300 grams, sensitivity 1/10 gram, diameter of pan 6" with set of weights 100 grams down. With side beam 1/10 to 8 gm. (not shown in cut).  
Each ..... Net 22.00



C-10470

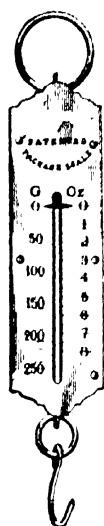
- C-10470 Balance, Improved Trip Scale—Harvard Design—Rough cast and forged iron parts have been replaced by parts of brass and steel, properly formed by tools and machinery, making them uniformly accurate and assembled with a degree of rigidity heretofore impossible, bearings consist of hardened steel prisms, resting on six agate shelves of large dimensions, graduated beam has range of 10 gm. in 1/10 gm. divisions, capacity, 2 kilos, sensitiveness, after continued use, guaranteed to 1/10 gm., but actual tests have shown sensitiveness greater than 0.01 gm.  
Each ..... Net 12.00



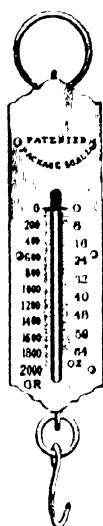
C-10475-76

- C-10475 Balances—Harvard Trip—Excellent for general laboratory use, capacity, 1 kilo, sensitiveness, 1/10 gm.; beam graduated up to 10 gm. in 1/10 gm. divisions, has two porcelain plates 150 gm. square.  
Each ..... Net 9.00  
C-10476 Same as above, but graduated in oz.  
Each ..... Net 9.00  
C-10477 Same as No C-10475, but round plate  
Each ..... Net 9.00  
C-10478 Same as No C-10476, but round plate  
Each ..... Net 9.00

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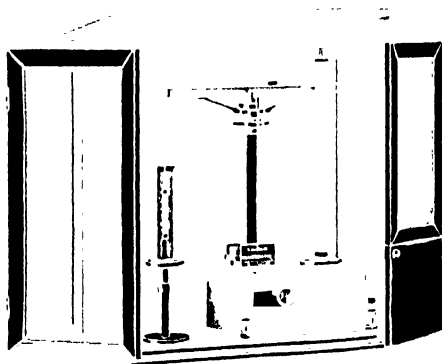
C-192



C-193

**C-192 Balances—Spring**—Graduated in English and Metric systems with broad pointer and nickel-plated front for either perpendicular or horizontal reading; reads to 8 ounces in  $\frac{1}{2}$  ounce divisions, and to 250 grams in 5 gram divisions.  
Each ..... 1.60

**C-193 Balances—Spring**—Graduated in English and Metric systems with broad pointer and nickel-plated front for either perpendicular or horizontal reading; reads to 4 pounds in 1 oz divisions, and to 2,000 grams in 10 gram divisions.  
Each ..... 2.00



C-195

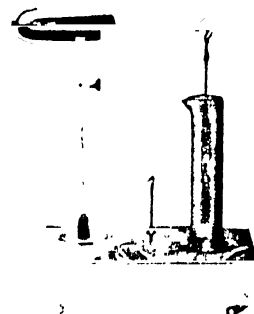
**C-195 Balance—Specific Gravity—Chainomatic**—Gives direct reading of Specific Gravity without use of weights or riders by use of chainomatic principle. Specially constructed case reduces air disturbances. Range to 20,000 Specific Gravity.  
In case .....  
Each ..... Net 100.00

**C-196 Balance—Specific Gravity—Chainomatic**—Same as No. C-195, but without case  
Each ..... Net 85.00

**C-200 Balance—Specific Gravity—Chainomatic**—Similar to No. C-195, but with range to 3,500 to third decimal place  
Each ..... Net 100.00

Prices subject to change without notice

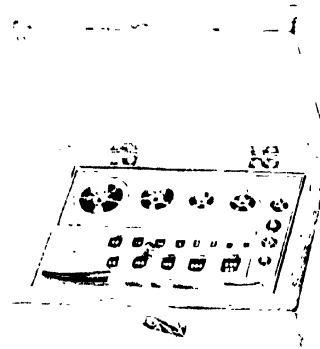
**C-201 Balance—Specific Gravity—Chainomatic**—Same as No. C-200, but without case  
Each ..... Net 85.00



C-10495

**C-10495 Balance, Specific Gravity—Westphal's**—For determining specific gravity of both liquids and solids, made of aluminum and furnished in portable case, with jar, riders, plummet, pincets and weight.  
Each ..... 27.50  
**Plummet only, for No. C-10495 above**  
Each ..... 5.00  
**Riders only, for No. C-10495 above**  
Per set of 8 ..... 2.50

**C-205 Balance Covers**—Of rubberized material. Please state size or make of balance when ordering.  
Each ..... 2.00



C-10540

**C-10540 Weights, Analytical—Volland's**—First quality, gold-plated, of brass screw-knob type, accurately adjusted; for general use, fractions from 500 to 50 mg are platinum, from 20 to 1 mg are aluminum, each weight fitted in separate compartment in mahogany, velvet-lined box, with loose or hinged cover.

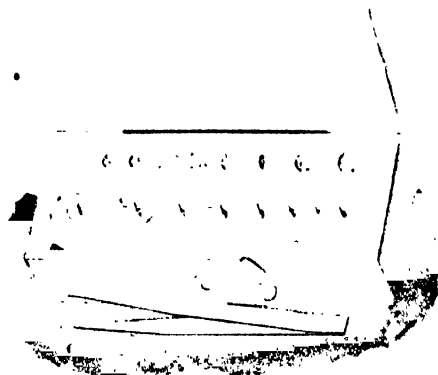
	No. A	B	C	D
Grams .....	10	20	50	100
Milligrams .....	1/10	1	1	1
Riders .....		3	3	3
Per set .....	Net 24.75	26.25	29.00	32.50

	No. E	F	G
Grams .....	200	500	1000
Milligrams .....	1	1	1
Riders .....	3	3	3
Per set .....	Net 42.50	50.00	60.00

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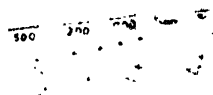


C-10545

**C-10545 Weights, Analytical—Volland's—** Second grade; made of brass, in two pieces, polished and lacquered, fractionals of German silver and aluminum, furnished in mahogany box with hinged cover

	No.	A	B	C	D
1 mg to		10	20	50	100
Per set	Net	9.75	11.00	13.50	16.00

	No.	E	F	G
1 mg to		200	500	1000 gm
Per set	Net	20.00	23.00	30.00



C-10555

**C-10550 Weights, Analytical—Troemner's—** Second grade, made of brass, with tapered body and screw-knob, all adjustment being made on the knob stem, no loose balancing material being used, weights polished and lacquered, fractionals of sheet aluminum, with one entire side turned up to facilitate handling, furnished in natural mahogany block with hinged lid, each weight in a separate compartment

	No.	A	B	C	D
1 mg to		10	20	50	100
Per set	Net	11.00	13.50	16.00	17.00

	No.	E	F	G
1 mg to		200	500	1000 gm
Per set	Net	20.50	25.00	30.00

**C-10555 Weights, Analytical—Troemner's—** Same as No C-10550 above, but furnished in box without lid

	No.	A	B	C	D
1 mg to		10	20	50	100
Per set	Net	9.75	11.00	13.25	14.50

	No.	E	F	G
1 mg to		200	500	1000 gm
Per set	Net	18.00	23.00	29.00

Prices subject to change without notice



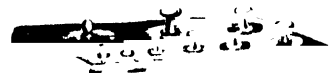
C-10560

**C-10560 Weights, Fractional—** Made of platinum, first quality

	No.	A	B	C	D	E
Mg		1	2	5	10	20
Each	Net	1.35	1.45	1.70	1.80	2.30
	No.	F	G	H	I	J
Mg		50	100	200	500	1000
Each	Net	3.00	4.00	5.00	6.50	9.75

**C-10565 Weights, Fractional—** Made of aluminum.

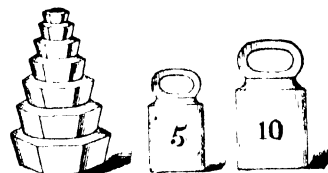
	No.	A	B	C	D	E
Mg		1	2	5	10	20
Per set	Net	.30	.30	.30	.30	.30
	No.	F	G	H	I	J
Mg		50	100	200	500	
Per set	Net	.30	.35	.55	.65	



C-10570

**C-10570 Weights—** Ordinary grade, brass, lacquered

	No.	A	B	C	D
10 mg to		20	50	100	200
Per set	Net	2.20	2.70	3.60	5.25
	No.	E	F	G	
10 mg to		500	1000	2000 gm	
Per set	Net	8.50	13.25	18.00	



C-10575

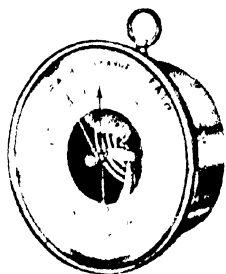
**C-10575 Gram Weights—** Of iron, for coarse weighing

	No.	A	B	C	D
Sets, 10 gm to		1	2	5	10 kilos
Per set	Net	4.25	6.50	11.00	18.00

**C-10600 Weights—Riders—** Of aluminum

	No.	A	B	C	D	E
Mg		5	6	1	12	2
Each	Net	1.05	1.05	.85	.85	.85
	No.	F	G	H	I	J
Mg		3	5	6	10	12
Each	Net	.85	.60	.60	.60	.60

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C-10605

**C-10605 Barometer—Aneroid**—Compensated for temperature and absolutely accurate, supplied to U. S. Navy, U. S. Weather Bureau and many scientific and educational institutions; is practically non-corrosive; nickel-steel or phosphor bronze parts being used wherever practicable, instead of steel; lacquered brass case, open center silvered metal dial, engraved and divided with great accuracy.

	No. A	B
Diam. of dial, in	5	6
Each	20.00	25.00



C-10610

**C-10610 Barometer—Fortin, U. S. Weather Bureau Type**—Most substantial and accurate instrument; length, 40 in.; graduated in inches and millimeters, and can be read to 0.01 in. and 0.1 mm.; tube is made of gun metal, mounted on polished, hardwood back, with thermometer attached to tube, provided with sliding vernier, operated by screw on side; scale is made of white porcelain, with black figures, and cannot discolor as all metal scales do.

Each . . . . . Net 80.00

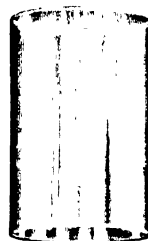


C-10614

**C-10614 Barometers—Improved Mercurial**—Especially designed for school use, for use in altitudes from sea level to 3,000 feet, double scale, in inches and millimeters with double verniers, reading to 1/100th inch and 1/10th mm.; black oxidized finish, brass scale, and vernier with white filled figures, sliding scale to allow for changing level of mercury in system, screw attachment for blocking mercury, mounted on oak board with Fahrenheit and Centigrade scale thermometer, length 39 inches.

Each . . . . . 28.50  
The above can be supplied for use in altitudes up to 5,000 and up to 8,000 ft. at an additional cost.

Prices subject to change without notice



C-1210



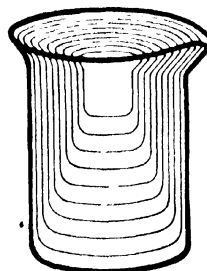
C-1215

**C-1210 Battery Jars**—Of clear, white glass, with ground rim.

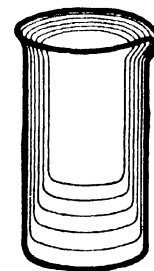
	No. B	F	I	J	K
Capacity, liters	1	3 1/2	3	4	10
Height, mm	125	200	275	225	300
Diameter, mm	100	150	125	150	200
Each	.45	.75	.80	.90	2.00

**C-1215 Battery Jars**—Square form, with straight, ground top.

	No. B	C	D	E	F
Capacity, oz	27	29	30	32	57
Height, in	5	4	6	7	8
Length, in	3 1/2	4	2 1/2	2 1/2	4
Width, in	3 1/2	4	4 1/4	4 1/4	4
Each	.50	.50	.65	.65	.75



C-1220



C-1240

**C-10625 Beakers, Aluminum**—Of superior finish.

	No. A	B	C	D	E
Capacity, cc	125	250	500	1000	2000
Each	.75	.95	1.35	1.85	4.25

**C-10630 Beakers, Copper—Polished**

	No. A	B	C	D	E
Capacity, cc	125	250	500	1000	2000
Each	.85	1.00	1.45	2.00	4.60

**C-10635 Beakers, Copper—Nickel-plated**

	No. A	B	C	D	E
Capacity, cc	125	250	500	1000	2000
Each	1.00	1.25	1.85	2.50	5.50

**C-1220 Beakers**—Of Pyrex glass, Griffin's low form, with lip.

	No. A	B	C	D	E
Capacity, cc	30	50	100	150	250
No. pieces in original case	312	216	156	156	168
Each	Net .18	.18	.19	.21	.25

In full case lots, less 10% discount

	No. F	G	H	I	J
Capacity, cc	400	600	800	1000	1300
No. pieces in original case	84	72	48	48	24
Each	Net .30	.35	.40	.54	.65

In full case lots, less 10% discount

	No. K	L	M	N	O
Capacity, cc	1500	2000	2500	3000	4000
No. pieces in original case	24	12	12	10	10
Each	Net .73	.98	1.20	1.40	1.80

In full case lots, less 10% discount.

Continued on Next Page

C-1222 **Beakers—Dye Pots—Pyrex**—Tall form with heavy walls and without spout or flange

	No.	A	B
Capacity, cc.		400	600
No. in original case		60	60
Each		.60	.60
In full case lots less 10%			

C-1225 **Beakers**—Of resistance glass, Griffin's low form with lip

	No.	B	D	E	G	J	L
Capacity, cc.		50	100	150	250	400	600
Each		.14	.15	.17	.20	.24	.28

	No.	N	O	P	Q	R	S
Capacity, cc.		800	1000	1500	2000	3000	4000
Each		.32	.42	.58	.80	1.12	1.44

C-1240 **Beakers**—Of Pyrex glass, usual form, with lip

	No.	A	B	C	D	E
Capacity, cc.		100	150	200	300	400
No. pieces in original case		156	120	168	144	60
Each	Net	.19	.21	.23	.26	.30
In full case lots, less 10% discount						

	No.	F	G	H	I
Capacity, cc.		500	600	800	1000
No. pieces in original case		60	60	48	36
Each	Net	.32	.35	.38	.54
In full case lots, less 10% discount					

C-1255 **Beakers**—Of resistance glass, usual form, without lip

	No.	C	E	G	H	I
Capacity, cc.		100	200	300	400	500
Each		.15	.19	.22	.24	.26



C-1273



C-1205

C-1275 **Bell Glasses—High Form**—With ground rim, larger sizes very useful for covering microscopes, etc.

	No.	C	H	K	L	O
Height, mm.		225	350	425	425	450
Diameter, mm.		175	200	215	225	250
Each		2.25	4.60	6.00	7.25	13.50

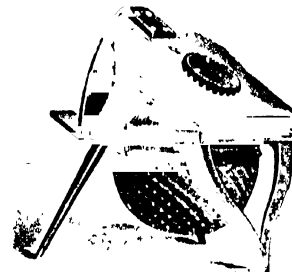
C-1295 **Bell Glasses—Open Top**—Of clear, white glass, with ground rim

	No.	A	B	C	E	F
Height, mm.		150	200	225	375	375
Diameter, mm.		75	100	125	175	215
Each		1.30	1.70	2.25	3.20	5.50

C-1297 **Bell Glasses—Open Top**—Similar to No. C-1295, but with wide opening at top. Sizes and prices the same as No. C-1295.

C-10960 **Blowers—Fletcher's Foot Power**—Produce a powerful, continuous blast, the pressure of which may be increased by adding one or more rubber discs to the air reservoir.

	No.	A	B	C
Diameter of air reservoir, mm.		180	225	275
Each		9.50	12.50	17.25



C-10965

C-10965 **Blowers—Fletcher's Foot Power**—Similar to No. C-10960 above, but mounted on legs, as illustrated.

	No.	A	B	C
Diameter of air reservoir, mm.		180	225	275
Each		10.75	14.25	19.50

C-10970 **Extra Rubber Discs** for above

	No.	A	B	C
Each		.75	1.15	1.65

C-215

C-217

C-5510 **Beakers**—Coores porcelain, with lip, glazed inside and outside, with exception of outside bottom surface

	No.	1	1a	2	3
Diameter rim, mm.		62	66	74	87
Diameter body, mm.		55	62	69	82
Height, mm.		93	108	118	143
Capacity, cc.		165	250	340	580
Each	Net	1.02	1.20	1.32	1.62

	No.	3a	4	5	6
Diameter, rim, mm.		93	103	114	122
Diameter body, mm.		90	100	110	118
Height, mm.		154	167	198	209
Capacity, cc.		700	970	1500	1775
Each	Net	1.98	2.40	3.30	5.10

C-5520 **Beakers, Dye Pots**, without lip, with heavy supporting flange, glazed inside and outside with exception of outside bottom surface

	No.	2	3	4
Diameter rim, mm.		86	96	127
Diameter below flange, mm.		87	90	115
Distance rim to supporting flange, mm.		42	42	38
Height, mm.		128	136	184
Capacity, cc. to level flange.		290	425	1125
Each	Net	1.44	2.10	3.30

Prices subject to change without notice

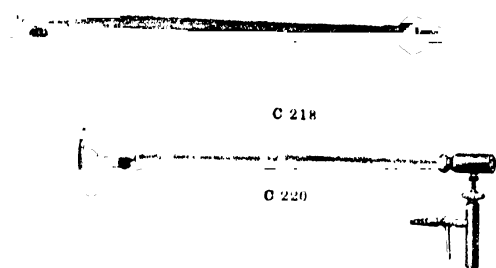
C-215 **Blow Pipe**—Japanned metal with movable brass tip.

Each	.18
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C-217 **Blow Pipe**—Plain, of brass, jewelers' form

	No.	A	B	C
Length, in.		8	10	12
Each		.18	.22	.28

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C-218 Blow Pipe—Same as No. C-217 above, but with air chamber

	No.	A	B	C
Length, in	8	10	12	
Each	.40	.45	.60	

C-220 Blow Pipe—Plattner's Nickel plated, with hard rubber mouth piece, but without platinum tip  
Each . . . . . 3.50

## BOTTLES



C-1310

C-1310 Bottles—Narrow Mouth—Of best American flint glass, for cork stoppers

	No.	A	B	C
Capacity, oz	1	1	2	
For cork No.	2	2	3	
No. in orig. case	864	864	720	
Per dozen	.60	.70	.75	
Per gross in orig. case	6.15	6.90	7.60	

	No.	D	E	F
Capacity, oz	3	4	6	
For cork No.	3	4	4	
No. in orig. case	576	432	360	
Per dozen	.90	1.00	1.15	
Per gross in orig. case	9.25	10.50	11.80	

	No.	G	H	I	J	K	L
Capacity, oz	8	12	16	20	24	32	
For cork No.	5	5	6	6	7	7	
No. in original case	288	216	144	120	120	96	
Per dozen	1.30	1.60	1.80	2.20	2.70	2.80	
Per gross in orig. case	13.50	17.30	19.70	24.00	29.70	30.00	

C-1315 Bottles—Narrow Mouth—Of best American green glass, for cork stoppers

	No.	A	B	C	D
Capacity	8 oz	10 oz	32	48	
For cork No.	5	6	8	9	
No. in orig. case	216	144	96	48	
Per dozen	1.05	1.50	2.25	2.75	

	No.	E	F	G
Capacity	64 oz	1 gal	2 gal	
For cork No.	10	11	14	
No. in orig. case	48	36	12	
Per dozen	3.60	6.00	15.00	

C-1320 Bottles—Narrow Mouth—Of best American amber glass, for cork stoppers

	No.	A	B	C	D	E
Capacity, oz	1	2	4	6	8	
For cork No.	2	3	4	4	5	
No. in original case	864	720	432	360	288	
Per dozen	.55	.60	.80	.90	1.10	
Per gross in original case	6.00	6.50	9.00	10.00	12.00	

	No.	F	G	H	I
Capacity, oz	16	24	32	48	
For cork No.	6	8	7	8	
No. in original case	144	120	96	48	
Per dozen	1.50	1.95	2.40	2.47	
Per gross in original case	17.00	21.50	26.00	30.00	

Prices subject to change without notice



C-1325



C-1355



C-1370

C-1325 Bottles—Flint glass—Tall and narrow in shape, designed for samples of oil and other liquids

	No.	A	B	C	D
Capacity, oz	1	2	4	8	
Per dozen	.70	1.35	1.50	2.60	

C-1335 Bottles—Wide Mouth—Of best American flint glass, for cork stoppers

	No.	A	B	C	D	E
Capacity, oz	1	1	2	3	4	
For cork No.	8	9	10	15	15	
No. in original case	864	864	720	576	432	
Per dozen	.60	.65	.70	.85	1.00	
Per gross in orig. case	6.40	6.90	7.60	9.25	10.70	

	No.	F	G	H	I	J	K
Capacity, oz	6	8	12	16	24	32	
For cork No.	16	17	17	24	22	24	
No. in original case	360	288	216	144	120	96	
Per dozen	1.10	1.25	1.65	1.90	2.55	2.75	
Per gross in orig. case	12.00	13.75	18.00	20.00	27.50	30.00	

C-1340 Bottles—Wide Mouth—Of green glass, for cork stoppers

	No.	A	B	C
Capacity	8 oz	16 oz	32 oz	
For cork No.	13	20	20	
No. in orig. case	216	144	96	
Per dozen	1.30	1.60	2.40	
	No.	D	E	F
Capacity	64 oz	1 gal	2 gal	
For cork No.	216 in	216 in	258 in	
No. in orig. case	48	36	12	
Per dozen	3.65	6.00	15.00	

C-1355 Bottles—Extra Wide Mouth—Of best American flint glass, with narrow shoulder, for cork stoppers

	No.	A	B	C	D
Capacity, oz	2	3	4	6	
For cork No.	10	14	22	18	
Per dozen	.90	1.00	1.30	1.30	

C-1370 Bottles—Narrow Mouth—Of flint glass, with flat, vertical glass stopper

	No.	A	B	C	D	E	F
Capacity, oz	1	1	2	3	4	6	
No. in original case	864	720	720	576	432	360	
Per dozen	1.60	1.75	1.80	1.95	2.20	2.60	
Per gross in orig. case	17.00	18.50	20.00	21.75	24.50	28.50	

	No.	G	H	I	J	K
Capacity, oz	8	12	16	32	64	
No. in original case	288	144	144	72	48	
Per dozen	2.75	3.60	3.75	5.20	8.50	
Per gross in orig. case	30.00	37.50	42.00	58.50	91.00	

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**C-1385 Bottles—Narrow Mouth** Of green glass, with flat, vertical glass stopper, especially intended for acids

	No. A	B	C
Capacity, oz	8	16	32
No. in orig. case	144	144	96
Per dozen	3.00	3.75	5.10
	No. D	E	F
Capacity, oz	64	1 gal	2 gal
No. in orig. case	48	36	12
Per dozen	8.40	11.40	24.00



C-1390



C-1395



C-1400

**C-1390 Bottles—Narrow Mouth** Of flint glass, with flat glass stopper, turned in a wet wooden mold which imparts a high luster to the outside surface, particularly recommended for use as laboratory reagent bottles

	No. A	B	C	D	E	F
Capacity, oz	1	2	4	8	16	32
No. in original case	864	720	432	288	144	72
Per dozen	2.40	2.70	3.00	4.00	6.00	8.00
Per gross in orig. case	24.50	27.00	33.00	40.00	65.00	77.00

**C-1395 Bottles—Narrow Mouth** Of flint glass, with high-ground, mushroom, glass stopper, has a fine, fire-polished finish, approaching shop furniture ware in appearance and much superior to iron mold finish, recommended especially for laboratory or other uses where a bottle of better appearance is desired

	No. A	B	C	D	E	F
Capacity, oz	1/2	1	2	3	4	6
No. in original case	864	720	720	576	432	360
Per dozen	1.60	1.80	2.00	2.10	2.25	2.70
Per gross in orig. case	17.00	19.00	21.00	22.50	25.00	30.00

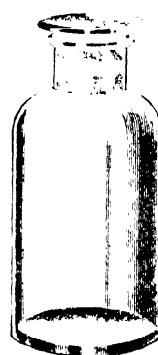
	No. G	H	I	J	K
Capacity, oz	8	12	16	32	64
No. in original case	288	144	144	96	12
Per dozen	3.00	3.60	4.10	5.75	9.60
Per gross in orig. case	33.00	39.50	45.00	63.00	...

	No. L	M	N
Capacity, gal	1	2	3
No. in original case	12	6	3
Per dozen	22.40	46.50	72.00

**C-1400 Bottles—Wide Mouth** Of flint glass, with flat, vertical glass stopper

	No. A	B	C	D	E
Capacity, oz	1/2	1	2	3	4
No. in original case	864	720	720	756	432
Per dozen	1.70	1.85	1.90	2.00	2.25
Per gross in original case	18.00	19.50	21.00	22.50	25.50

	No. F	G	H	I	J
Capacity, oz	6	8	12	16	32
No. in orig. case	360	288	144	144	72
Per dozen	2.75	2.90	3.50	3.80	5.60
Per gross in original case	29.50	31.00	38.00	42.00	61.50



C-1410



C-1420

**C-1415 Bottles—Wide Mouth** Of flint glass, with flat glass stopper, very carefully ground

	No. A	B	C	D	E	F
Capacity, oz	1	2	4	8	16	32
No. in original case	864	720	432	288	144	72
Per dozen	2.40	2.50	3.20	3.75	5.10	7.20
Per gross in orig. case	26.50	28.00	35.00	41.00	56.00	80.00

**C-1420 Bottles—Wide Mouth** Of flint glass, with high ground-glass stopper, same quality as No. C-1415.

	No. A	B	C	D	E	F
Capacity, oz	1/2	1	2	3	4	6
No. in original case	864	720	720	576	432	360
Per dozen	1.70	1.85	1.90	2.00	2.25	2.75
Per gross in orig. case	18.00	19.50	21.00	22.50	25.00	29.50

	No. G	H	I	J	K
Capacity, oz	8	12	16	32	64
No. in original case	288	144	144	72	48
Per dozen	2.90	3.50	3.80	5.60	8.60
Per gross in orig. case	31.00	38.00	42.00	61.50	...

	No. L	M	N
Capacity, gal	1	2	3
No. in original case	12	6	4
Per dozen	27.50	52.00	110.00

**C-1425 Bottles—Extra Wide Mouth** Of flint glass, with flat, glass stopper

	No. A	B	C	D
Capacity, oz	2	3	4	6
Per dozen	.95	1.05	1.40	1.50
Per gross	9.60	10.50	14.00	15.60

*Continued on Next Page*



**Bottles—Reagent** The reagent bottles offered below have ground-glass labels, blown in the glass, the surface of each letter being so ground as to render it distinct. The lettering is thin, indestructible and in no danger of being defaced when the bottle is washed or handled, and the inconvenience and unsightly appearance attending the use of paper labels is entirely avoided. These bottles are made of glass containing no lead, zinc or other metallic flux and are unequalled as regards their convenient shape, thin dropping lip and perfect stoppering. They are

exclusively used in many of the leading laboratories of the United States. The list of labels available in the various sizes will be submitted upon application.

<b>C-1430 Bottles—Reagent</b>	Narrow mouth, capacity, 1 oz., height, 5 3/8 in.	
Each		.20
Per dozen		2.00
<b>C-1435 Bottles—Reagent</b>	Narrow mouth, capacity, 4 oz., height, 5 1/4 in.	
Each		.29
Per dozen		2.95
<b>C-1440 Bottles—Reagent</b>	Narrow mouth, capacity, 8 oz., height, 6 1/2 in.	
Each		.35
Per dozen		3.60
<b>C-1445 Bottles—Reagent</b>	Narrow mouth, capacity, 16 oz., height, 7 3/4 in.	
Each		.50
Per dozen		5.20
<b>C-1450 Bottles—Reagent</b>	Narrow mouth, capacity, 32 oz., height, 9 1/2 in.	
Each		.75
Per dozen		7.50
<b>C-1455 Bottles—Reagent</b>	Wide mouth, capacity, 1 oz., height, 3 3/8 in.	
Each		.20
Per dozen		2.00
<b>C-1460 Bottles—Reagent</b>	Wide mouth, capacity, 4 oz., height, 4 3/8 in.	
Each		.30
Per dozen		3.25



C-1480



C-1485

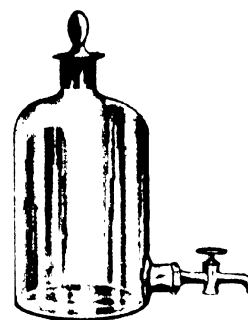
**C-1480 Bottles—Aspirator**—Of heavy, white glass; with outlet near bottom

	No.	B	C	D	E
Capacity, cc	500	1000	2000	4000	
Each	1.00	1.60	2.00	3.20	

**C-1485 Bottles—Aspirator**—Of heavy, white glass, with outlet tube near bottom, formed into nipple for attaching rubber tubing

	No.	B	C	D	E	F
Capacity, cc	250	500	1000	2000	4000	
Each	.95	1.40	2.10	2.50	3.75	

Prices subject to change without notice



C-1490

**C-1490 Bottles—Aspirator**—With ground-glass stopper and glass stopcock, ground into outlet near bottom

	No.	B	C	D	E
Capacity, cc	500	1000	2000	4000	
Each	4.20	4.80	5.40	7.50	



C-1500



C-1510

**C-1500 Bottles—Balsam** Having wide mouth with loose glass rod and glass cap, capacity, 60 cc.  
Each .30

**C-1510 Bottles—Oil Immersion, B. & L.**—With metal cap  
Each 1.50

**C-1535 Bottles—Dropping** With ground-in pipette, delivery may be controlled by finger or by use of a rubber bulb

	No.	A	B	C
Capacity, cc	15	30	50	
Each	.24	.26	.29	



C-1540



C-1550

**C-1540 Bottles—Dropping**—Same as No. C-1535, but provided with rubber bulb

	No.	A	B	C
Capacity, cc	15	30	50	
Each	.27	.29	.32	

**C-1550 Bottles—Dropping**—TK type with stopper grooved to deliver contents drop by drop or hermetically seal bottle; with flat stopper protecting the lip of bottle from dust

	No.	A	B	C	D	E
Capacity, cc	15	30	50	100	200	
Each	.23	.23	.33	.40	.50	

Continued on Next Page



C-1605



C-1620

**C-1605 Bottles—Specific Gravity** With thermometer ground into neck and with side capillary tube with ground-on cap

	No.	A	B	C
Capacity, cc	25	50	100	
Each	4.00	4.10	5.00	

**C-1620 Bottles—Specific Gravity—Gay-Lussac's** With perforated stopper, accurately adjusted

	No.	A	B	C	D	E	F
Capacity, cc	1	2	5	10	25	50	
Each	1.60	1.75	1.90	2.00	2.20	2.40	

**C-1625 Bottles—Specific Gravity—Gay-Lussac's** With perforated stopper, unadjusted

	No.	A	B	C	D	E	F
Capacity, cc	1	2	5	10	25	50	
Each	.80	.80	.80	.90	1.00	1.15	



C-1635



C-1680



C-1685



C-1690

**C-1635 Bottle, Specific Gravity—Le Châtelier's** New form, to accord with the requirements of the U. S. Bureau of Standards, as used for testing cements. Without certificate

Each	6.00
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**C-1680 Bottles—Specific Gravity—Squibb's.**

	No.	A	B	C
Capacity, cc	25	50	100	
Each	1.25	1.50	2.00	

**C-1685 Bottle—Specific Gravity—Walker's**—For very fluid liquids, capacity 20 cc

Each	2.50
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**C-1690 Bottle—Specific Gravity—Walker's**—For viscous liquids, capacity 30 cc

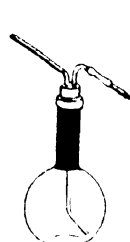
Each	2.25
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(Can also be supplied in 25 and 50 cc sizes)

**C-1700 Bottles—Washing—Faraday's**—With rubber stopper and glass tubes, outlet tube having rubber joint to give flexibility

	No.	B	D	E	F	G
Capacity, cc	250	500	750	1000	2000	
Each	.30	.45	.60	.70	.90	

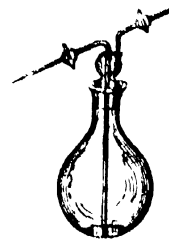
Prices subject to change without notice



C-1710



C-1715



C-1720

**C-1710 Bottles—Washing** Of Pyrex glass, stopper and tubes same as No. C 1700, but neck covered with wicker for convenient use with hot fluids

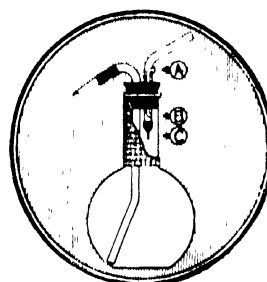
	No.	B	C	D	E
Capacity, cc	250	500	700	1000	
Each	.80	1.10	1.20	1.25	

**C-1715 Bottles—Washing** With glass tubes and glass stopper ground in, designed for use with volatile liquids

	No.	B	C	D
Capacity, cc	250	500	1000	
Each	.75	1.00	1.20	

**C-1720 Bottles—Washing** With glass tubes, stopcocks and glass stopper ground in

	No.	A	B	C	D
Capacity, cc	125	250	500	1000	
Each	4.50	4.75	5.00	5.25	



C-1723

**C-1723 Bottles—Washing—Spencer's**—Having special inner tube with Bunsen valve by which a continuous stream of water may be maintained, by removing thumb from "A" the stream is instantly stopped through the elimination of pressure, with flexible outlet and wicker wound around neck

	No.	A	B	D	E
Capacity, cc	250	500	1000	2000	
Each	1.50	1.75	2.00	2.30	



C-1745



C-1785

**C-1745 Bottles—Weighing**—High form, with ground-glass stopper, very light

	No.	A	D	F	H
Height, mm	50	65	75	80	
Diameter, mm	15	15	22	15	
Each	.27	.30	.40	.30	

	No.	I	K	L
Height, mm	90	100	100	
Diameter, mm	18	25	40	
Each	.45	.52	.75	

**C-1785 Bottles—Weighing—Lunge's**—With ground-in stopper with bulb and two glass stopcocks, for weighing corrosive liquids, capacity, about 15 cc.

Each	4.00
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Continued on Next Page



C 1755 60

**C-1755 Bottles—Weighing** Low form, with ground-glass stopper

No.	A	B	C	D	E	G
Height, mm	40	50	50	50	60	70
Diameter, mm	25	25	30	40	30	35
Each	.33	.36	.40	.52	.46	.52

**C-1760 Bottles—Weighing** Low form, with ground glass stopper

No.	A	B	C
Height, mm	30	50	30
Diameter, mm	50	60	70
Each	1.30	1.65	1.95



C 1790

**C-1790 Bottles—Woulff's** Of heavy glass, with two necks

No.	B	C	D	E	F
Capacity, cc	250	500	1000	2000	4000
Each	2.50	2.75	3.50	4.50	6.00



C-1800



C 1805

**C-1795 Bottles—Woulff's** Of heavy glass, with three necks

No.	B	C	D	E	F
Capacity, cc	250	500	1000	2000	4000
Each	2.50	2.75	3.50	4.50	6.00

**C-1800 Bottles—Woulff's** Of heavy glass, with two necks and tubulature near bottom

No.	A	B	C	D
Capacity, cc	500	1000	2000	4000
Each	3.50	4.50	6.00	8.00

**C-1805 Bottles—Woulff's** Of heavy glass, with three necks and tubulature near bottom

No.	A	B	C	D
Capacity, cc	500	1000	2000	4000
Each	3.50	4.50	6.00	8.00

**C-11015 Bottle Washer**—A small faucet attachment, the use of which is not at all limited to bottles but will be found equally serviceable for cleaning test tubes and flasks, etc. The jet of water is turned off and on instantly by a turn of the brass outlet tube.

Each ..... 1.50

Prices subject to change without notice



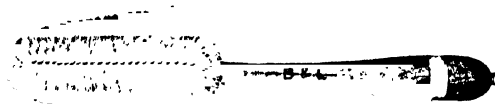
C 11025

**C-11025 Boxes—Tin** Seamless

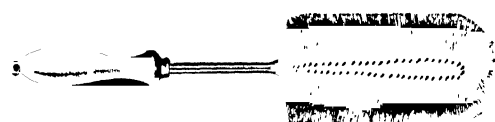
No.	A	B	C	D
Capacity, gm	5	10	15	20
Per gross	1.20	1.50	1.80	2.40
No.	E	F	G	
Capacity, gm	60	125	250	
Per gross	3.90	5.75	8.20	



C-11040



C-11045



C-11050

**C-11040 Brushes—Bristle** With wooden handle, for cleaning small cylinders, etc.

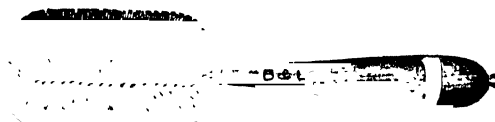
Each	.30
Per dozen	3.15

**C-11045 Brushes—Bristle** With wooden handle, for cleaning large cylinders

No.	A	B
Number of rows	3	4
Each	.28	.35
Per dozen	2.85	3.65

**C-11050 Brushes—Bristle** With wooden handle, for cleaning small jars

Each	.25
Per dozen	2.70



C-11055

**C-11055 Brushes—Bristle** With wooden handle, for cleaning large jars

No.	A	B	C
Number of rows	3	4	6
Each	.40	.43	.45
Per dozen	4.40	4.70	4.95



C-11065

**C-11065 Brushes—Bottle, Pivoted**—With tufted end; length, 12 in., by means of pivot attaching body of brush to handle, the brush always presents a firm and complete surface to inside of bottle.

Each	.16
Per dozen	1.70

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C-11070 **Brushes—Flask**—With pliable end, which adapts itself to curvature of flask, facilitating thorough cleaning  
Each . . . . .30

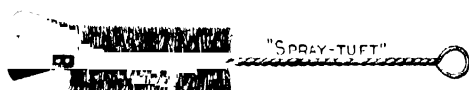
C-11085 **Brushes—Camel's Hair**—Miniature size, bound in quill handle

	No.	A	B	C	D
Numbers	1	2	3	4	
Length of hair, mm	8	10	12	14	
Per dozen					
Per gross	1.30	1.50	2.00	2.25	

	No.	E	F	G	H
Numbers	5	6	7	8	
Length of hair, mm	16	18	20	22	
Per dozen					
Per gross	3.00	3.50	4.00	4.50	

C-11090 **Brushes—Camel's Hair**—Flat, for dusting side pans

	No.	A	B	C	D
Width, mm	12	25	37	50	
Each	22	32	42	62	
Per dozen	2.50	3.40	4.55	6.80	



C-11112 27

C-11112 **Brushes—Test Tube—Spray-Tuft**—A new type of brush of unusual efficiency which leaves no space in the tube untouched, prevents breakage of tubes, as well as unbroken mass of bristle on the bottom and sides of tube, on brass wire  
Each . . . . .08  
Per dozen . . . . .80  
Per gross . . . . .9.25

C-11120 **Brushes—Test Tube**—On tinned iron wire, bristle  
Each . . . . .04  
Per dozen . . . . .35  
Per gross . . . . .3.40

C-11125 **Brushes—Test Tube**—On tinned iron wire, bristle with bristle end  
Each . . . . .07  
Per dozen . . . . .70  
Per gross . . . . .7.25

C-11127 **Brushes—Test Tube—Spray-Tuft**—Same as No. C-11112, but on tinned iron wire  
Each . . . . .07  
Per dozen . . . . .70  
Per gross . . . . .7.25

C-11130 **Brushes—Test Tube**—On tinned iron wire, bristle, with sponge end  
Each . . . . .07  
Per dozen . . . . .70  
Per gross . . . . .7.25

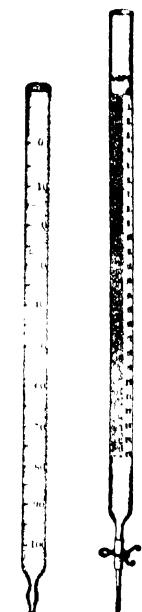
C-11145 **Brush—Tube**—For cleaning narrow tubes, bristle, on tinned iron wire  
Each . . . . .05  
Per dozen . . . . .26  
Per gross . . . . .2.90

C-11150 **Brushes—Tube**—For cleaning burettes, bristle, on tinned iron wire one meter long  
Each . . . . .12  
Per dozen . . . . .1.25  
Per gross . . . . .13.60

C-11160 **Brushes—Tube**—For cleaning cylinders, large tubes, bottles, etc., bristle, on brass wire

	No.	A	B	C	D
Length, mm	250	300	375	500	
Each	1.15	1.25	1.45	1.80	
Per gross	13.20	14.45	17.00	21.30	

## BURETTES



C-1840 C-1845

C-1840 **Burettes—Mohr's**—Without fittings, for pinchcock

	No.	D	G	K
Capacity, cc	25	50	100	
Graduated, cc	1/10	1/10	1/5	
Each	30	.42	.72	

C-1845 **Burettes—Mohr's Precision**—Graduated to meet the specifications of the U. S. Bureau of Standards, adjusted at a temperature of 20°C for pinchcock, without fittings

	No.	A	B
Capacity, cc	10	25	
Graduated, cc	1/20	1/10	
Each	4.50	5.00	

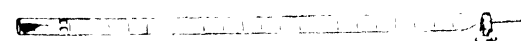
	No.	C	D
Capacity, cc	50	100	
Graduated, cc	1/10	1/5	
Each	6.80	8.00	



C-1850

C-1850 **Burettes—Mohr's**—With side tube for refilling, for pinchcock, without fittings

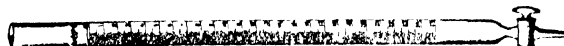
	No.	C	E	H
Capacity, cc	25	50	100	
Graduated, cc	1/10	1/10	1/5	
Each	.36	.55	.80	



C-1855

C-1855 **Burettes—Mohr's**—With Geissler's stopcock, straight

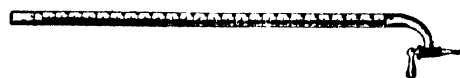
	No.	C	F	J
Capacity, cc	25	50	100	
Graduated, cc	1/10	1/10	1/5	
Each	1.05	1.15	1.50	



C-1860

C-1860 **Burettes—Mohr's Precision**—Graduated to meet the specifications of the U. S. Bureau of Standards, with Geissler's glass stopcock, straight

	No.	A	B	C	D
Capacity, cc	10	25	50	100	
Graduated, cc	1/20	1/10	1/10	1/5	
Each	7.20	9.75	10.50	11.50	



C-1875

C-1875 **Burettes—Mohr's**—With Fresenius' glass stopcock; bent

	No.	C	E	H
Capacity, cc	25	50	100	
Graduated, cc	1/10	1/10	1/5	
Each	1.30	1.45	1.90	

Prices subject to change without notice

Continued on Next Page



C-1880

**C-1880 Burettes—Mohr's Precision**—Graduated to meet the specifications of the U. S. Bureau of Standards, with Fresenius' glass stopcock, bent

	No.	A	B	C	D
Capacity, cc	10	25	50	100	
Graduated, cc	1/20	1/10	1/10	1/5	
Each	8.00	10.50	11.50	12.25	



C-1890

**C-1890 Burettes**—With patent, three way, glass stopcock

	No.	A	B	E
Capacity, cc	25	50	100	
Graduated, cc	1/10	1/10	1/10	
Each	1.95	2.40	3.15	



C-1895

**C-1895 Burettes—Mohr's Precision**—Graduated to meet the specifications of the U. S. Bureau of Standards, with three way, glass stopcock

	No.	A	B	C	D
Capacity, cc	10	25	50	100	
Graduated, cc	1/20	1/10	1/10	1/5	
Each	9.25	11.75	12.75	13.50	



C-1915 20-30

**C-1915 Burettes—Schellbach's**—With dark blue stripe on white enameled background, for accurate reading of the meniscus, for pinchcock, without fittings

	No.	A	B	C	D
Capacity, cc.	25	50	75	100	
Graduated, cc.	1/10	1/10	1/10	1/5	
Each	1.60	1.80	2.25	2.50	

**C-1920 Burettes—Schellbach's**—With dark blue stripe on white enameled background, for pinchcock, with side tube for refilling. Without fittings

	No.	A	B	C	D
Capacity, cc	25	50	75	100	
Graduated, cc	1/10	1/10	1/10	1/5	
Each	1.75	2.00	2.50	2.75	

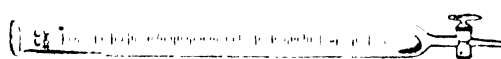
**C-1925 Burettes—Schellbach's**—With dark blue stripe on white enameled background, as above, with Geissler's stopcock, straight

	No.	A	B	C	D
Capacity, cc	25	50	75	100	
Graduated, cc	1/10	1/10	1/10	1/5	
Each	2.75	3.20	3.50	3.75	

**C-1930 Burettes—Schellbach's**—With dark blue stripe on white enameled background, with patent, three-way, glass stopcock, as shown in illustration No. C-1890.

	No.	A	B	C	D
Capacity, cc .....	25	50	75	100	
Graduated, cc ...	1/10	1/10	1/10	1/5	
Each .....	3.50	3.80	4.00	4.20	

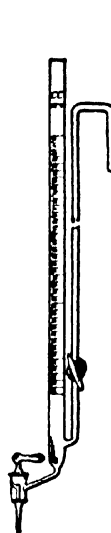
Prices subject to change without notice



C-1945

**C-1945 Burettes—Dispensing**—Wide form, with glass stopcock, straight

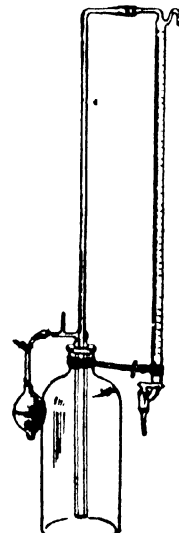
	No.	A	B	C	D
Capacity, cc			250	500	1000
Graduated, cc			1	2	5
Each			2 10	2 70	3 60



C-1965



C-1970



C-1975

**C-1965 Burettes—Gavalowsky's**—With side tube and ground stopcock to connect with reservoir for refilling

	No.	A	B	D
Capacity, cc . . . . .	25	50	100	
Graduated, cc . . . . .	1/10	1/10	1/5	
Each . . . . .	2.50	2.75	3.50	

**C-1970 Burettes—Automatic**—With three-way stopcock, zero point and overflow cup, with dark blue, enameled stripe on white background for accurate reading of the meniscus

	No.	A	B	D
Capacity, cc . . . . .	25	50	100	
Graduated, cc . . . . .	1/10	1/10	1/5	
Each . . . . .	5.50	6.00	6.50	

**C-1975 Burettes—Automatic Zero, Squibb's**—Latest form, filled by pressure from rubber bulb, all joints ground air-tight, with dark blue stripe on white enameled background for accurate reading, price includes complete apparatus, with bulbs, reservoir, clamp and burette

	No.	A	B
Capacity, cc .....	25	50	
Graduated, cc .....	1/10	1/10	
Each .....	8.50	9.00	

**C-2010 Burette Attachments**—For use on burettes without stopcocks, consist of pinchcock, glass tip and rubber tubing to connect with burette

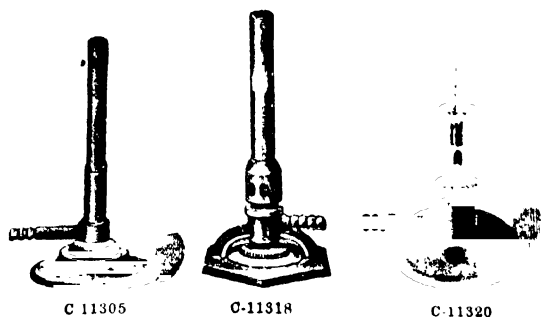
	No.	A	B	C
Size	Small	Medium	Large	
Each	.25	.25	.30	

**C-2020 Burette Tips**—Of glass, for Attachment No. C-2010.

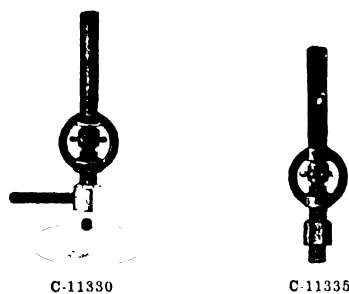
Each	.05
Per dozen	.50

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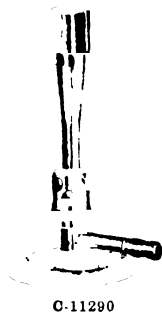
## BURNERS



- C-11305 **Burners—Bunsen's** Usual size, with air regulator  
Each ..... 40
- C-11318 **Burners—Tirrill Type** With adjustments for air and gas  
Each ..... 1.70
- C-11320 **Burners—Bunsen's Adjustable** Readily adjustable for gas and air, a desirable burner for universal use  
Each ..... 1.35



- C-11330 **Burners—Bunsen's Combination**—Adjustable for coal or gasoline gas, with regulators for air and gas, height, 7 in.  
Each ..... 1.70
- C-11335 **Burners—Bunsen's Combination**—Same as No. C-11330 above, but without base, for screwing into gas pipes  
Each ..... 1.50

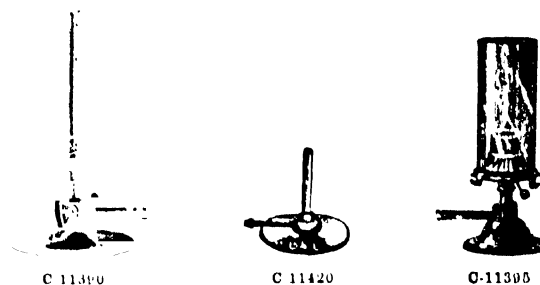


- C-11290 **Burners—High Temperature, Meker's**—With nickel grids; only the sizes in general use here listed, other shapes, blast burners, etc.; quoted upon request. Can likewise be supplied for Natural or Gasoline Gas.

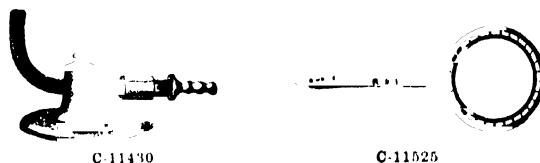
## For Artificial Gas:

	No.	A	B	C
Height, mm	115	130	155	
Diameter of flame, mm	16	20	24	
Each	2.00	2.20	2.75	

Prices subject to change without notice

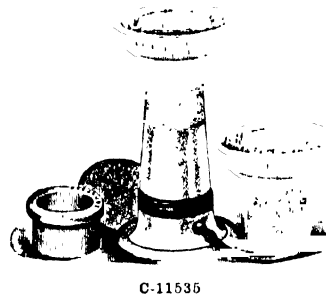


- C-11390 **Burners—Bunsen's** With pilot flame  
Each ..... 2.10
- C-11395 **Burners—Aigand** Low form, with glass chimney, 7 in. high, flame is adjustable and can be burned very low  
Each ..... 1.45
- C-11420 **Burners—Bunsen's Micro** Permits a very small flame to be obtained, nickel plated, height, 60 mm, without mica chimney  
Each ..... .85



- C-11430 **Burners—Bunsen's**—Low form, with air regulator  
Each ..... .60
- C-11450 **Burners—Illuminating** Height, 200 mm  
Each ..... 1.45
- C-11455 **Burners—Illuminating**—Height, 300 mm  
Each ..... 2.10
- C-11525 **Burners—Bunsen's Ring Form** For use on apparatus support for heating funnels, flasks, etc., with air regulator

	No.	A	B	C	D
Diameter of rings, mm	75	100	125	150	
Each	1.70	1.80	2.05	2.30	

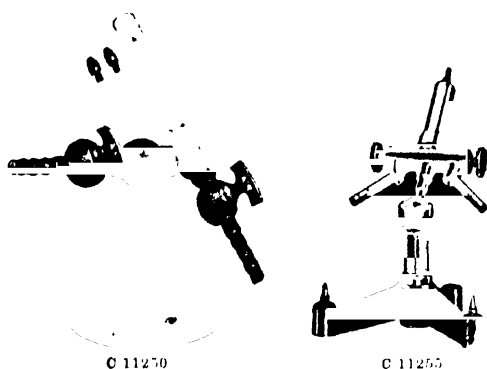


- C-11535 **Burners—Chaddock's Non-corrodible**—Will be appreciated by every chemist who has used metal burners in hoods, as it is incorrodible, the gas exit being of glass and the rest of porcelain and white fire clay, consists of three sections serving for various laboratory requirements, and is supplied with flame spreader, asbestos disc and asbestos rings; small chimney is for platinum triangles  
Each ..... Net 4.00

## Separate Parts for No. C-11535:

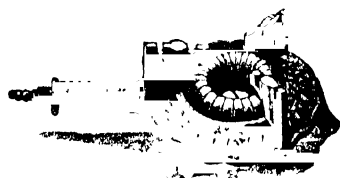
Towers, each	Net	.50
Rings, each	Net	.20

Continued on Next Page



**C-11250 Burners—Blast Lamps—Bunsen's** For gas, adjustable, with separate stopcocks, and controlling air and gas, improved form with movable sleeve and three tips.  
Each ..... 4.70

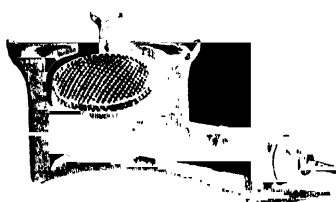
**C-11255 Burners—Blast, Massachusetts Institute of Technology pattern** Readily detachable from stand for use as hand blowpipe, mounted on ball socket, set of three gas nipples and two sleeves, needle valves afford easy and accurate regulation of both gas and air supply.  
Each ..... 6.75



C-11555

**C-11555 Burners—Fletcher's Radial**—Made of annealed cast-iron and very strong, works equally well with coal or water gas, producing practically solid flame, which does not run to a point in the center.

	No.	A	B
Diameter of burner ring, mm	90	125	
Each	3.40	5.25	



C-11565

**C-11565 Burners—Fletcher's Solid Flame**—For large pans and quick boiling.

	Size	A	B
Diameter, mm	75	100	
Each	2.20	2.70	



C-11175

**C-11175 Burners—Alcohol Stove**—For denatured alcohol, of nickel-plated brass and readily adjustable, giving intensely hot flame; diameter, 6 3/8 in.; height over all 5 1/2 in.  
Each ..... 4.70

Prices subject to change without notice



C-11500

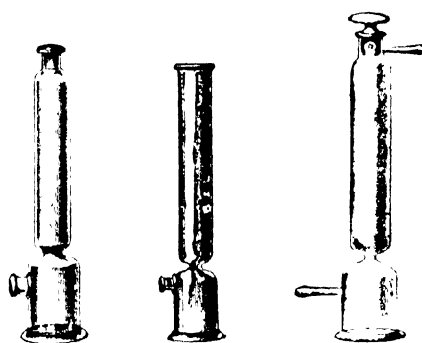


C-11460

**C-11460 Burner Tips—Wing top**, for bending glass tubing.

	Size	A	B
For burners of	7 16"	1 2"	diameter
Each	.12	.16	

**C-11500 Burner Guards—Vitrified Earthenware**—For protecting the flame from draughts, can also be used as a support, height, 9 in.; bottom, 8 in.; top, 5 in.  
Each ..... .50



C-2050

C-2055

C-2060

**C-2050 Calcium Chloride Cylinders—Narrow mouth** On foot, with tubulature near bottom.

	No.	A	B	C
Height, mm	210	260	315	
Diameter, mm	25	40	45	
Each	1.45	1.75	2.20	

**C-2055 Calcium Chloride Cylinders—Wide mouth** On foot, with tubulature near bottom.

	No.	A	B	C
Height, mm	210	260	315	
Diameter, mm	25	40	45	
Each	1.45	1.75	2.20	

**C-2060 Calcium Chloride Cylinders—Narrow mouth**, with perforated ground glass stopper and side tube near top, on foot.

	No.	A	B	C
Height, mm	210	260	315	
Diameter, mm	25	40	45	
Each	4.00	4.20	4.70	



C-2065



C-2075-80

**C-2065 Calcium Chloride Tubes—With one bulb; straight.**

	No.	A	C	D	E	F
Length, mm.	75	100	125	150	200	
Each	.12	.13	.16	.17	.21	

Continued on Next Page

C-2070	Calcium Chloride Tubes	With one bulb, bent					
	No.	A	B	C	D	E	
	Length, mm	75	100	125	150	200	
	Each	.12	.13	.16	.17	.21	

C-2075	Calcium Chloride Tubes	With two bulbs, straight					
	No.	A	B	C	D	E	
	Length, mm	75	100	125	150	200	
	Each	.13	.15	.17	.20	.24	

C-2080	Calcium Chloride Tubes	With two bulbs, bent					
	No.	A	B	C	D	E	
	Length, mm	75	100	125	150	200	
	Each	.13	.15	.17	.20	.24	

C-2085	Calcium Chloride Tubes	With two bulbs, and small, inner tubes to collect moisture					
	No.	A	B	C	D	E	
	Length, mm	75	100	125	150	200	
	Each	.24	.26	.32	.34	.43	

N.B.—The length of Calcium Chloride Tubes Nos. C-2065, -70, -75, -80, -85, is measured from the mouth to the bottom of the lower bulb.



C-2090



C-2100



C-2125

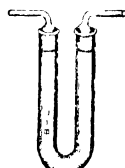
C-2090	Calcium Chloride Tubes	U-shaped					
	No.	A	B	C	D		
	Length, mm	75	100	125	150		
	Each	.14	.15	.19	.23		

C-2100	Calcium Chloride Tubes	U-shaped, with two side tubes					
	No.	A	B	C	E		
	Length, mm	100	125	150	200		
	Each	.23	.30	.38	.60		

C-2125	Calcium Chloride Tubes—Schwartz's	With side tubes and perforated glass stoppers					
	No.	A	B	C	D	E	
	Length, mm	100	125	150	175	200	
	Each	.78	.85	.96	1.20	1.50	



C-2130



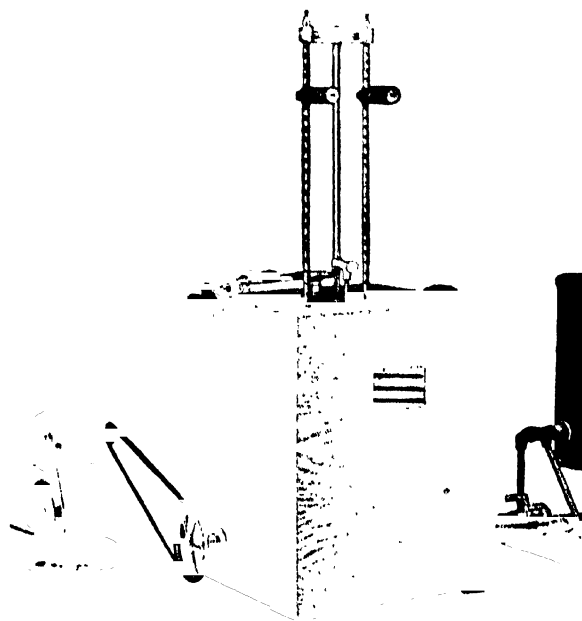
C-2135

C-2130	Calcium Chloride Tubes	With ground-in, outlet tubes					
	No.	A	B	C			
	Length, mm	100	125	150			
	Each	.80	.90	1.05			

C-2135	Calcium Chloride Tubes—Pelligot's	With three bulbs					
	No.	A	B	C	D	E	
	Length, mm	100	125	150	175	200	
	Each	.52	.65	.85	1.05	1.30	

Prices subject to change without notice

## CALORIMETERS



C-251

**C-251 Calorimeters—Parr's New Adiabatic** This calorimeter is equipped with bomb of Illum alloy, insoluble in nitric and sulfuric acids and of especially high tensile strength. The operation is free from complicated details and the temperature of the jacket water is maintained at the same stage as that of the inner system so that the water surrounding the bomb neither loses nor gains heat throughout the determination. This is effected by the accurate control of hot and cold water sources and the distribution of the incoming water by means of an unusually efficient stirring device. Temperature lag is reduced to a minimum, the water circulating on all sides of the calorimeter space, top as well as sides and bottom, by means of a small rotary pump.

Calorimeter without motor or thermometers

Each ..... Net 400.00

**C-252** Motor for use with the above of Universal type for 110 or 220 volts

Each ..... Net 30.00

**C-253** Thermometer for use with the above, 65° to 90°C with B. of S. certificate

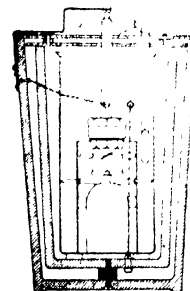
Each ..... Net 12.00

**C-254** Thermometer for use with the above, 65° to 105°C with B. of S. certificate

Each ..... Net 15.00

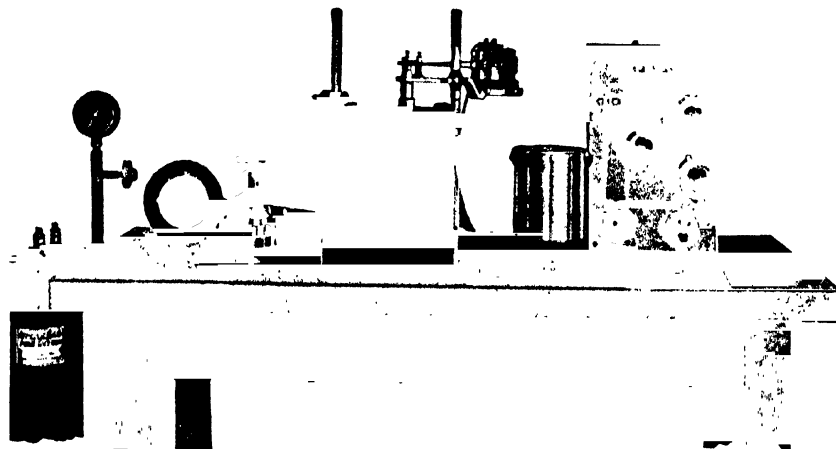
**C-255 Calorimeter—Parr Peroxide Bomb** This calorimeter, using sodium peroxide as a combustion medium, has been very widely used where an inexpensive calorimeter is desired which does away with the necessity of maintaining a supply of oxygen gas. Complete with measuring cup, standardized thermometer, 2000-cc graduated flask, 5" 100-mesh sieve, brush and sufficient chemical for 50 determinations.

Each ..... Net 100.00



C-255

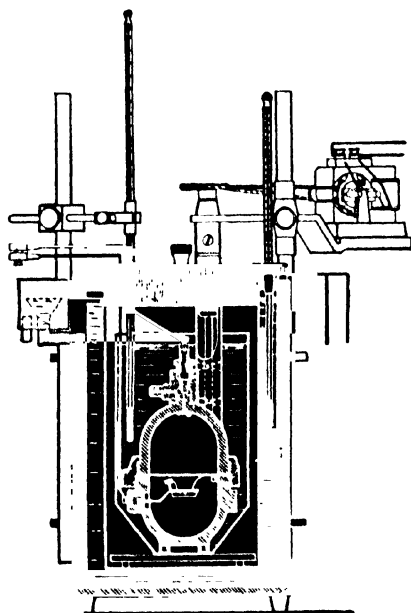
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C-230

## SINGLE VALVE BOMB WITH REGULAR JACKET

- C-230 Calorimeter—Emerson Oxygen Bomb—Single valve, regular jacket bomb with spun nickel lining, calorimeter jacket double walled, oxygen piping for S. S. White (small) or L inde oxygen tanks, stirrer with motor, nickel fuel pan, thermometer holder, spanner, gaskets, etc. Unless otherwise specified the double piping connections for S. S. White cylinders will be supplied.  
Each ..... Net 245.00
- C-232 Calorimeter—Emerson Oxygen Bomb—Same as above but with gold lined bomb  
Each ..... 350.00
- C-235 Calorimeter—Emerson Oxygen Bomb—Double valve type, particularly valuable where gaseous products of combustion are to be measured. Same equipment as listed under No. C-230 above.  
Each ..... 255.00
- C-237 Calorimeter—Emerson Oxygen Bomb—Same as No. C-235 above but with gold lined bomb  
Each ..... 385.00

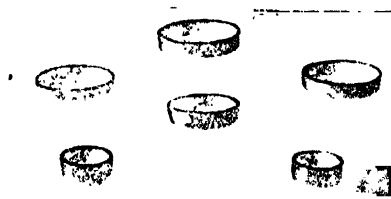


C-240

- C-240 Calorimeter—Emerson Oxygen Bomb, With Daniels' Adiabatic Jacket—Permits of test under ideal conditions, namely with calorimeter bucket surrounded by jacket of same temperature to minimize exchange of heat. Temperature of jacket is carried along with temperature of calorimeter by passing electric current through jacket using the water as a resistor. Cannot, therefore, be used on direct current. Eliminates the fragile character of vacuum wall cups and likewise the necessity of cooling corrections and radiation curve. Complete with single valve steel bomb, nickel lined; calorimeter bucket, single or double oxygen piping (when not otherwise specified the double piping for S. S. White cylinders will be supplied); stirring device with motor, spanner wrench, thermometer reader, gaskets, etc.  
Each ..... 285.00
- C-242 Calorimeter—Emerson Oxygen Bomb, with Daniels' Adiabatic Jacket—Same as No. C-240 above but with double valve type bomb, nickel lined.  
Each ..... Net 295.00
- C-244 Calorimeter—Emerson Oxygen Bomb, with Daniels' Adiabatic Jacket—Same as No. C-240 above but with gold lined bomb.  
Each ..... Net 405.00
- Note—Calorimeter thermometers not included in the above prices. Adiabatic jacket cannot be used with direct current without use of rotary converter. Descriptive literature on request.
- C-248 Thermometer—Calorimeter—With U. S. Bureau of Standards certificate, range 18 to 30°C, graduated in 1/50°C.  
Each ..... Net 42.50
- C-250 Thermometer—Calorimeter—For Daniels' Jacket, range 15° to 35°C, graduated in 1/10°C.  
Each ..... Net 6.00
- Note—Beckman Thermometers both with and without U. S. Bureau of Standards certificate can be supplied. Prices on request.

Prices subject to change without notice

Continued on Next Page



C-6010

**C-6010 Capsules—Vitreosil—Glazed**—Specially adapted for ash determinations, ignitions, etc., are entirely resistant to acids and will withstand rapid changes of temperature without cracking.

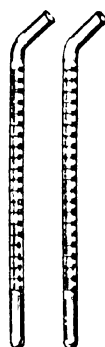
	No.	A	B	C	D	E	F
Approximate capacity, cc.	10	15	20	30	35	40	
Diameter inside, mm.	35	44	51	57	60	70	
Depth in center inside, mm.	13	13	13	13	13	16	
Each	.85	.85	1.15	1.15	1.35	1.65	



C-2200



C-2160



C-2165



C-2170

**C-2160 Carbon Tubes**—For Eggertz' color comparison test, for the estimation of carbon and manganese in steel, of superior quality, the tubes of each set bearing corresponding numbers so that they may be readily kept together.

	No.	A	B	C	D	E	G
Capacity, cc.	10	25	30	50	50	100	
Graduated, cc.	1/10	1/10	1/10	1/10	1/5	1/5	
Per set of 2	2.00	2.00	2.50	3.00	2.50	3.50	
Per set of 4	4.50	4.50	5.50	6.60	5.50	7.70	

**C-2165 Carbon Tubes—Julian's**—Same as No. C-2160 above, but with bent ends, permitting the mixing of the contents without the use of a stopper in the tube, lower portion of tube is ungraduated.

	No.	A	B	C	D
Capacity, cc.	0.50	5.30	10.50	10.70	
Graduated, cc.	1/10	1/10	1/10	1/10	1
Per set of 2	2.25	2.75	3.00	3.00	
Per set of 4	5.00	6.00	6.60	6.60	

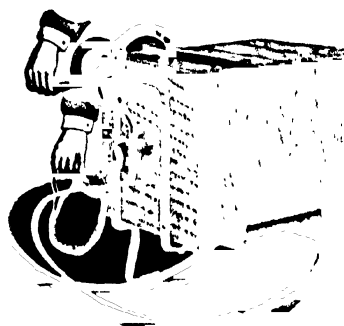
**C-2170 Carbon Tubes**—Same as No. C-2160 above, but of test tube form, graduated.

	No.	A	B	C	D	E
Capacity, cc.	5	10	15	20	25	
Graduated, cc.	1/10	1/10	1/10	1/10	1/10	
Each	.24	.30	.36	.45	.50	

Prices subject to change without notice

**C-2200 Carbon Filter Tubes**—With stems ground to point.

	No.	A	B	C	D	E
Diameter, mm.	20	25	30	35	40	
Each	.15	.20	.25	.35	.40	



C-11595

**C-11595 Carboy Inclinator—Flaherty's**—A simple device, whereby a carboy is tilted and its contents poured out at will, with little exertion and without spilling or splashing; single movement of lever locks inclinator to the carboy; strongly built of iron with all cast parts malleable.

Each ..... 10.00



C-5535 40

**C-5535 Casseroles**—Coors porcelain, glazed with exception of rim, with lip and flat porcelain handle.

	No.	1	2	3	3a	4
Outside diam., mm.	50	70	85	95	110	
Inside diam., mm.	47	66	80	90	105	
Height, mm.	25	35	45	50	62	
Capacity, cc.	30	75	150	210	375	
Each	.42	.48	.60	.84	1.08	
	No.	4a	5	6	7	
Outside diam., mm.	133	140	165	175		
Inside diam., mm.	130	130	160	170		
Height, mm.	68	88	95	130		
Capacity, cc.	500	750	1250	2000		
Each	1.38	1.68	2.40	4.20		

**C-5540 Casseroles**—Ohio porcelain, with porcelain handle.

	No.	1	2	3	3a
Capacity, cc.	30	75	150	210	
Diameter over body, mm.	50	70	85	95	
Each	.35	.45	.50	.70	
	No.	4	5	6	7
Capacity, cc.	375	750	1250	2000	
Diameter over body, mm.	110	135	165	175	
Each	.85	1.55	1.95	3.35	

**C-5541 Casseroles**—Coors porcelain, with extra long flat porcelain handle glazed inside and outside with exception of rim, size No. 4, diameter, mm., 117; height, mm., 56, capacity, cc., 360.

Each ..... 1.32

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## CEMENT TESTING EQUIPMENT



C 275

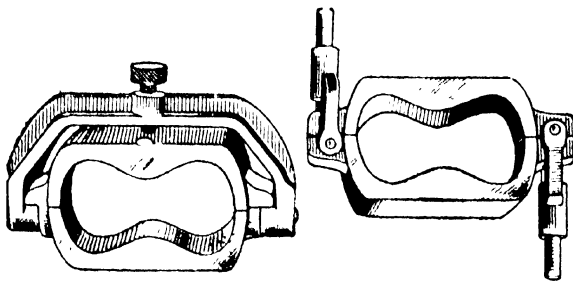
**C-275 Cement Testing Machine—Olsen's** Capacity 1000 pounds, of shot type, breaking load is weighed automatically on scale placed on frame of machine. Very rapid in operation and supplied with latest type of A S C E standard roller clips.

Each . . . . . Net 225.00

**C-277 Cement Testing Machine—Olsen's** Same as above but of 2000 pound capacity.

Each . . . . . Net 335.00

Compression and transverse Testing Machines can be supplied. Prices on request.



C 280

C 282

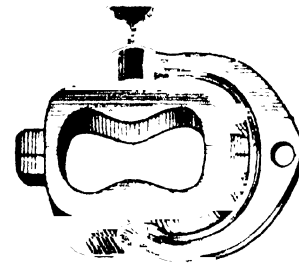
**C-280 Cement Briquet Molds**—Improved standard with means for separating sections automatically without rapping, according to specifications of A S T M.

Each . . . . . Net 4.50

**C-282 Cement Briquet Molds**—With end clamps according to specifications of A S T M.

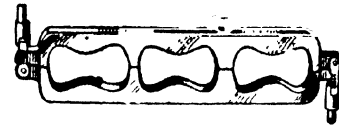
Each . . . . . Net 4.50

Prices subject to change without notice



C-284

**C-284 Cement Briquet Molds** Standard with "C" clamp  
Each . . . . . Net 4.50



C-287

**C-287 Cement Briquet Gang Molds** Standard, with end and center clamps according to specifications of A S T M

	No.	A	B	C	D	E
No. in gang . . . . .	2	3	4	5	6	
Each . . . . .	Net 9.00	12.40	16.50	20.60	24.75	

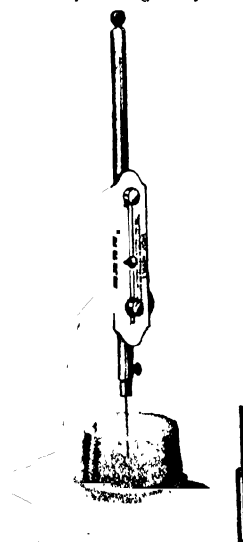
**C-288 Cement Cube Molds** These can be supplied with brass hinged clamp for one or two inch cube in gangs of one, two and three

Prices on application

C-290

**C-290 Cement Briquet Mold Brushes** Of brass wire with wooden handle  
Each . . . . . Net 1.50

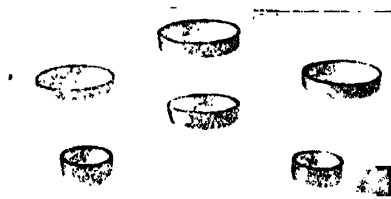
**Cement Specific Gravity Bottles**—See No C-1635 Le-Chatelier specific gravity bottle.



C-295

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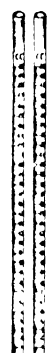
C-6010

**C-6010 Capsules—Vitreosil—Glazed**—Specially adapted for ash determinations, ignitions, etc., are entirely resistant to acids and will withstand rapid changes of temperature without cracking.

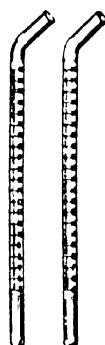
	No.	A	B	C	D	E	F
Approximate capacity, cc.	10	15	20	30	35	40	
Diameter inside, mm.	35	44	51	57	60	70	
Depth in center inside, mm.	13	13	13	13	13	16	
Each	.85	.85	1.15	1.15	1.35	1.65	



C-2200



C-2160



C-2165



C-2170

**C-2160 Carbon Tubes**—For Eggertz' color comparison test, for the estimation of carbon and manganese in steel, of superior quality, the tubes of each set bearing corresponding numbers so that they may be readily kept together.

	No.	A	B	C	D	E	G
Capacity, cc.	10	25	30	50	50	100	
Graduated, cc.	1/10	1/10	1/10	1/10	1/5	1/5	
Per set of 2	2.00	2.00	2.50	3.00	2.50	3.50	
Per set of 4	4.50	4.50	5.50	6.60	5.50	7.70	

**C-2165 Carbon Tubes—Julian's**—Same as No. C-2160 above, but with bent ends, permitting the mixing of the contents without the use of a stopper in the tube, lower portion of tube is ungraduated.

	No.	A	B	C	D
Capacity, cc.	0.50	5.30	10.50	10.70	
Graduated, cc.	1/10	1/10	1/10	1/10	1
Per set of 2	2.25	2.75	3.00	3.00	
Per set of 4	5.00	6.00	6.60	6.60	

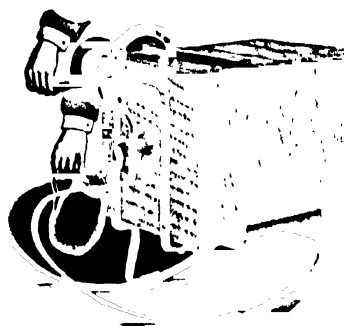
**C-2170 Carbon Tubes**—Same as No. C-2160 above, but of test tube form, graduated.

	No.	A	B	C	D	E
Capacity, cc.	5	10	15	20	25	
Graduated, cc.	1/10	1/10	1/10	1/10	1/10	
Each	.24	.30	.36	.45	.50	

Prices subject to change without notice

**C-2200 Carbon Filter Tubes**—With stems ground to point.

	No.	A	B	C	D	E
Diameter, mm.	20	25	30	35	40	
Each	.15	.20	.25	.35	.40	



C-11595

**C-11595 Carboy Inclinator—Flaherty's**—A simple device, whereby a carboy is tilted and its contents poured out at will, with little exertion and without spilling or splashing; single movement of lever locks inclinator to the carboy; strongly built of iron with all cast parts malleable.

Each ..... 10.00



C-5535 40

**C-5535 Casseroles**—Coors porcelain, glazed with exception of rim, with lip and flat porcelain handle.

	No.	1	2	3	3a	4
Outside diam., mm.	50	70	85	95	110	
Inside diam., mm.	47	66	80	90	105	
Height, mm.	25	35	45	50	62	
Capacity, cc.	30	75	150	210	375	
Each	.42	.48	.60	.84	1.08	
	No.	4a	5	6	7	
Outside diam., mm.	133	140	165	175		
Inside diam., mm.	130	130	160	170		
Height, mm.	68	88	95	130		
Capacity, cc.	500	750	1250	2000		
Each	1.38	1.68	2.40	4.20		

**C-5540 Casseroles**—Ohio porcelain, with porcelain handle.

	No.	1	2	3	3a	
Capacity, cc.	30	75	150	210		
Diameter over body, mm.	50	70	85	95		
Each	.35	.45	.50	.70		
	No.	4	5	6	7	
Capacity, cc.	375	750	1250	2000		
Diameter over body, mm.	110	135	165	175		
Each	.85	1.55	1.95	3.35		

**C-5541 Casseroles**—Coors porcelain, with extra long flat porcelain handle glazed inside and outside with exception of rim, size No. 4, diameter, mm., 117; height, mm., 56, capacity, cc., 360.

Each ..... 1.32

Continued on Next Page

270	Board of Health disc without tubes Each . . . . .	Net 17 50	551	Shaw separatory glass funnels, for butter testing about 75 cc . . . . .	Net 3 35
280	5 in. diam. perforated bronze basket with copper drip can . . . . .	Net 34 00	552	250 cc. glass prescription bottles Per dozen . . . . .	Net 2 50
290	11 in. diameter perforated bronze basket with cop- per draining chamber . . . . .	50 00	554	Squibb glass separatory funnels, 150 cc Each . . . . .	Net 3 50
302	15 cc. metal tubes, Cornell style with rubber cushions . . . . .	Net 80	556	Goetz glass phosphorus tubes with stoppers Each . . . . .	Net 3 50
312	Reducing caps for 15 cc. glass tubes in 50 cc. metal tubes . . . . .	Net 22	558	250 cc. glass sterilizer bottles Per dozen . . . . .	Net 3 75
313	Reducing caps for 25 cc. glass tubes in 50 cc. metal tubes . . . . .	Net 22	561	2 cc. Board of Health glass tubes Per 100 . . . . .	Net 6 50
320	50 cc. metal tubes, Cornell style with rubber cushions . . . . .	Net .95	566	Rubber stoppers for Board of Health tubes Per 100 . . . . .	Net 2 25
325	50 cc. trunnion rings . . . . .	Net .60	568	Set 20 Board of Health tubes and 40 stoppers Each . . . . .	Net 2 75
362	Babcock test trunnion cups with rubber pads Each . . . . .	Net .90	570	15 cc. rubber cushions, Cornell style Per dozen . . . . .	Net 1 00
363	Square trunnion cups for sputum bottles, No. 585 Each . . . . .	Net 2 25	571	50 cc. rubber cushions, Cornell style Per dozen . . . . .	Net 2 15
368	Trunnion ring for metal tubes, No. 369 Each . . . . .	Net 2 15	579	Rubber pads for Babcock trunnion cups, No. 362 Per dozen . . . . .	Net 60
369	Metal tube for 6 oz. nursing bottles with rubber cushions . . . . .	Net 2 25	580	Rubber caps for tubes, Nos. 502, 505, 507 Per dozen . . . . .	Net .75
373	Trunnion cups for 250 cc. bottles Nos. 552, 558 with rubber cushions . . . . .	Net 5 00	581	Rubber cushions for 250 cc. bottles No. 552 Each . . . . .	Net .40
392	Trunnion carriers for 150 cc. Squibb Separatory funnels . . . . .	Net 3 00	582	Rubber cushions for 250 cc. bottles No. 558 Each . . . . .	Net .80
393a	Trunnion carriers for Shaw Separatory funnels Each . . . . .	Net 2 25	583	Rubber caps for 250 cc. bottles No. 558 Per dozen . . . . .	Net 1 75
395	Trunnion carriers for Goetz phosphorus tubes, No. 556 . . . . .	Net 3 50	584	Molded soft rubber caps for glass tubes No. 520 Per dozen . . . . .	Net .85
502	15 cc. plain glass tubes Per dozen . . . . .	Net 2 20	585	Square sputum bottles with corks Per dozen . . . . .	Net 85
	Per six dozen . . . . .	Net 8 75		Per gross . . . . .	Net 9 25
505	15 cc. graduated glass tubes, 1/10 cc. div. Per half dozen . . . . .	Net 3 25	594	Rubber cushions for 6 oz. sterilizer nursing bottles Each . . . . .	Net 35
506	25 cc. plain glass tubes Per dozen . . . . .	Net 2 75	598	Rubber cushions for Goetz tube Each . . . . .	Net 1 95
507	15 cc. round bottom plain glass tubes Per dozen . . . . .	Net 1 40	750	Speed revolution counter Each . . . . .	Net 2 50
	Per six dozen . . . . .	Net 6 00			
508	15 cc. narrow neck glass tubes Per dozen . . . . .	Net 2 75			
510	10 cc. Hopkins vaccine tubes Each . . . . .	Net 1 20			
	Per 1/2 dozen . . . . .	Net 5 25			
511	Babcock test tubes for human milk Each . . . . .	Net .60			
	Per 1/2 dozen . . . . .	Net 2 75			
515	50 cc. plain lipped glass tubes Per dozen . . . . .	Net 2 75			
	Per six dozen . . . . .	Net 11 00			
520	50 cc. plain narrow neck glass tubes Per dozen . . . . .	Net 2 75			
	Per six dozen . . . . .	Net 11 00			
525	50 cc. graduated glass tubes 1/2 cc. div. to 10 cc., 1 cc. div. to 50 cc. . . . .	Net 3 50			
	Per 1/2 dozen . . . . .	Net 3 50			
535	Hart casein tubes Per 1/2 dozen . . . . .	Net 2 75			

Prices subject to change without notice



C-11629

**C-11629 Centrifuge—Hand Model—Bausch & Lomb—**Gives 1200 R.P.M. with 50 turns of the handle; gears and pinion are protected from dust, handle construction makes it impossible to stop so suddenly that the contents of the tube are spilled. Complete with two-arm sedimentation attachment, 15 cc. tubes, one graduated and the other ungraduated.

Each . . . . . **12 50**

*Continued on Next Page*

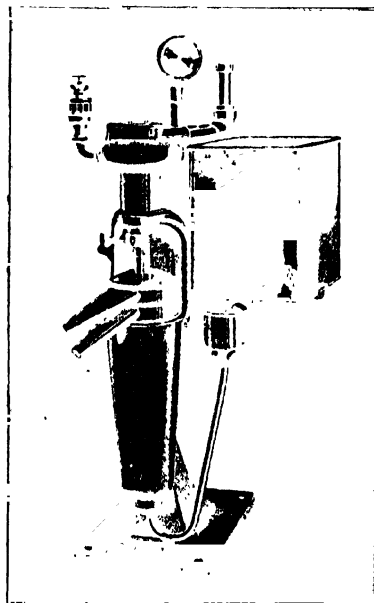


C-11635

- C-11635 **Centrifuge—Electric**—An especially rigid and heavily built machine with rheostat incorporated in base, speed 1800 R.P.M. with two 15 cc. tubes. Tube carrier acts as heavy balance wheel to insure ability and fan blades mounted below prevent overheating of windings of motor. Ball bearings and complete with cord and plug. Height 24 cm., rotating diameter 29 cm. Maximum current consumption  $\frac{3}{4}$  ampere.
- |                                  |            |           |
|----------------------------------|------------|-----------|
| No. A For 110 Volts A.C. or D.C. | Each ..... | Net 38.00 |
| No. B For 220 Volts A.C. or D.C. | Each ..... | Net 43.00 |
- (Please state voltage and current when ordering.)

- C-11639 **Centrifuge—Electric**—Same construction as No. C-11635 above, but with tube carrier for four 15 cc. tubes.
- |                                  |            |           |
|----------------------------------|------------|-----------|
| No. A For 110 Volts A.C. or D.C. | Each ..... | Net 42.00 |
| No. B For 220 Volts A.C. or D.C. | Each ..... | Net 47.00 |
- (Please state voltage and current when ordering.)

- C-11642 **Dome Protector**, for above centrifuges, highly desirable as a safety factor, to prevent splashing and to increase the efficiency and speed of the machine approximately 50 per cent.
- |             |           |
|-------------|-----------|
| Extra ..... | Net 12.50 |
|-------------|-----------|



C-11625

- C-11625 **Centrifuge—Sharpless Laboratory**—With turbine wheel attached to shaft for driving by steam at 20 pounds pressure. R.P.M. of bowl 40000 developed.

Prices subject to change without notice

oping a centrifugal force of about 41000 times that of gravity, consists of cast iron frame with steel tube or bowl 2 in. in diameter and 8 in. long suspended vertically from a flexible steel spindle, height 24 in., weight 55 lb.

Each .....

Net 150.00

- C-11625A **Centrifuge—Sharpless Laboratory**—Same as No. C-11625 above, but driven by compressed air, 15 cubic feet per minute at 20 lb. pressure being required.

Each .....

Net 150.00

Hand driven and motor driven centrifuges of the above type can be supplied. Prices and further information upon request.

- C-305 **Charcoal Blocks**—Of fine hardwood charcoal, for blow piping and similar operations. Size 4" x 1".

Per dozen .....

1.15

- C-306 **Charts—Atomic Weight**—Compiled by Dr. F. W. Clarke for the American Chemical Society and corrected up to 1918, size 42" x 62", mounted on linen back with rollers.

Each .....

Net 4.75

- C-307 **Charts—Mendelejeff Periodic System**—Compiled by Dr. F. W. Clarke, and corrected up to 1918, giving the periodic arrangement of the elements according to Mendelejeff on the basis of Oxygen = 16. Size 42" x 62", mounted on linen back with rollers.

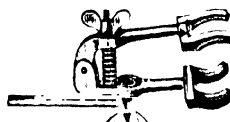
Each .....

Net 4.75

- C-308 **Charts—Metric**—Compiled by the U. S. Bureau of Standards showing, in full size and in perspective where necessary, the units of the International Metric System together with comparisons with units of the English system. Tables showing the derivation of the names of the metric units and their abbreviations, together with tables of Metric and English equivalents are included, size 25" x 41", on heavy paper without rollers.

Each .....

Net .30



C-11670



C-11680

- C-11670 **Clamps—Universal Apparatus**—For condensers, etc., provided with swivel jaws, adapting themselves to irregular shapes.

	No. A	B	C
Size	Small	Medium	Large
Each	.65	.70	.85

- C-11680 **Clamps—Burette**—For one burette.

Each .....

.50



C-11687



C-11694

- C-11687 **Clamps—Burette—Double**, for two burettes.

Each .....

.75

- C-11694 **Clamps—Burette**—Of stamped steel, adjustable by check-nut to any angle, an excellent clamp for general use.

Each .....

.40

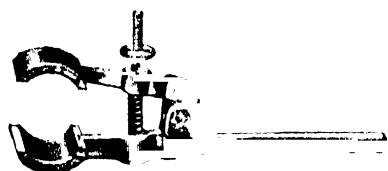
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C-11706

**C-11706 Clamps—Burette**

	No.	A	B	C
Size		Small	Large	Extra Large
Each		.40	.55	.85



C-11714

**C-11714 Clamps—Burette—** For holding burettes or tubes at any angle

	No.	A	B	C
Size		Small	Medium	Large
Each		.35	.55	.60



C-11718



C-11720

**C-11718 Clamp Holders** For attaching clamps, extension rings, ring burners, etc., to apparatus support

	No.	A	B
Size		Small	Large
Each		.30	.35

**C-11720 Clamp Holders—Universal** To set at any angle

Each		.70
------	--	-----



C-11795 11800

**C-11795 Clamps—Test Tube, Stoddard's** Of brass

	No.	A	B
Size		Small	Large
Each		.20	.25
Per dozen		2.25	2.65

**C-11800 Clamps—Test Tube, Stoddard's** Of nickel-plated spring wire

	No.	A	B
Size		Small	Large
Each		.12	.15
Per dozen		1.20	1.50

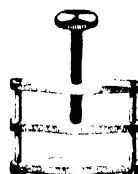
Prices subject to change without notice



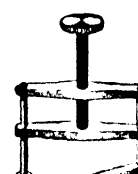
C-11785

**C-11785 Clamps—Test Tube** Of wood with spring

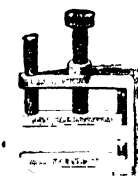
Each		.22
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C-11825



C-11830



C-11835

**C-11825 Clamps—Tubing, Hoffmann's**—For rubber tubing nickel-plated

	No.	A	B
Size		Small	Large
Each		.25	.30
Per dozen		2.80	3.20

**C-11830 Clamps—Tubing, Hoffmann's** Improved form; can be attached to tubing without disconnecting apparatus

	No.	A	B
Size		Small	Large
Each		.27	.30
Per dozen		3.00	3.25

**C-11835 Clamps—Tubing, Hoffmann's**—Improved form; can be attached to tubing without disconnecting apparatus

	No.	A	B
Size		Small	Large
Each		.30	.32
Per dozen		3.20	3.50



C-11840

**C-11840 Clamps—Tubing, Mohr's Pinchcock**—Of spring wire

	No.	A	B	C	D
Size		Small	Medium	Large	Extra Large
Each		.13	.15	.18	.30
Per dozen		1.50	1.70	2.00	3.40

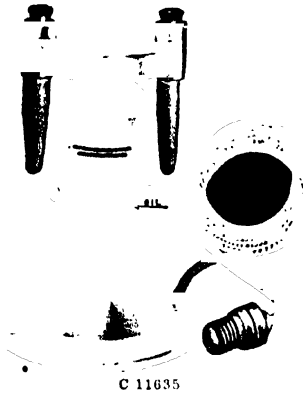
**C-11845 Clamps—Watch Glass**—Of brass, nickel-plated, without watch glasses

	No.	A	B
Size		Small	Large
Each		.25	.30
Per dozen		2.60	2.90

**C-11850 Clamps—Watch Glass, Bunsen's**—Without watch glasses

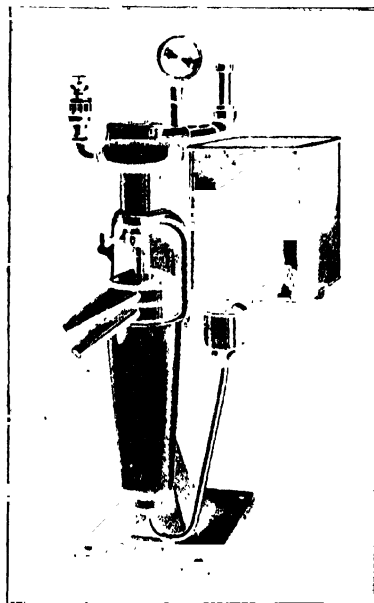
	No.	A	B
Diameter, mm		50	65
Each		.30	.35
Per dozen		2.90	3.25

Continued on Next Page



C-11635

- C-11635 **Centrifuge—Electric**—An especially rigid and heavily built machine with rheostat incorporated in base, speed 1800 R.P.M. with two 15 cc. tubes. Tube carrier acts as heavy balance wheel to insure ability and fan blades mounted below prevent overheating of windings of motor. Ball bearings and complete with cord and plug. Height 24 cm., rotating diameter 29 cm. Maximum current consumption  $\frac{3}{4}$  ampere.
- |                                  |            |           |
|----------------------------------|------------|-----------|
| No. A For 110 Volts A.C. or D.C. | Each ..... | Net 38.00 |
| No. B For 220 Volts A.C. or D.C. | Each ..... | Net 43.00 |
- (Please state voltage and current when ordering.)
- C-11639 **Centrifuge—Electric**—Same construction as No. C-11635 above, but with tube carrier for four 15 cc. tubes.
- |                                  |            |           |
|----------------------------------|------------|-----------|
| No. A For 110 Volts A.C. or D.C. | Each ..... | Net 42.00 |
| No. B For 220 Volts A.C. or D.C. | Each ..... | Net 47.00 |
- (Please state voltage and current when ordering.)
- C-11642 **Dome Protector**, for above centrifuges, highly desirable as a safety factor, to prevent splashing and to increase the efficiency and speed of the machine approximately 50 per cent.
- |             |           |
|-------------|-----------|
| Extra ..... | Net 12.50 |
|-------------|-----------|



C-11625

- C-11625 **Centrifuge—Sharpless Laboratory**—With turbine wheel attached to shaft for driving by steam at 20 pounds pressure. R.P.M. of bowl 40000 developed.

Prices subject to change without notice

oping a centrifugal force of about 41000 times that of gravity, consists of cast iron frame with steel tube or bowl 2 in. in diameter and 8 in. long suspended vertically from a flexible steel spindle, height 24 in., weight 55 lb.

Each .....

Net 150.00

- C-11625A **Centrifuge—Sharpless Laboratory**—Same as No. C-11625 above, but driven by compressed air, 15 cubic feet per minute at 20 lb. pressure being required.

Each .....

Net 150.00

Hand driven and motor driven centrifuges of the above type can be supplied. Prices and further information upon request.

- C-305 **Charcoal Blocks**—Of fine hardwood charcoal, for blow piping and similar operations. Size 4" x 1".

Per dozen .....

1.15

- C-306 **Charts—Atomic Weight**—Compiled by Dr. F. W. Clarke for the American Chemical Society and corrected up to 1918, size 42" x 62", mounted on linen back with rollers.

Each .....

Net 4.75

- C-307 **Charts—Mendelejeff Periodic System**—Compiled by Dr. F. W. Clarke, and corrected up to 1918, giving the periodic arrangement of the elements according to Mendelejeff on the basis of Oxygen = 16. Size 42" x 62", mounted on linen back with rollers.

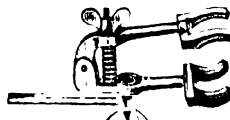
Each .....

Net 4.75

- C-308 **Charts—Metric**—Compiled by the U. S. Bureau of Standards showing, in full size and in perspective where necessary, the units of the International Metric System together with comparisons with units of the English system. Tables showing the derivation of the names of the metric units and their abbreviations, together with tables of Metric and English equivalents are included, size 25" x 41", on heavy paper without rollers.

Each .....

Net .30



C-11670



C-11680

- C-11670 **Clamps—Universal Apparatus**—For condensers, etc., provided with swivel jaws, adapting themselves to irregular shapes.

Size	No.		
	A	B	C
	Small	Medium	Large
Each .....	.65	.70	.85

- C-11680 **Clamps—Burette**—For one burette.

Each .....

.50



C-11687



C-11694

- C-11687 **Clamps—Burette—Double**, for two burettes.

Each .....

.75

- C-11694 **Clamps—Burette**—Of stamped steel, adjustable by check-nut to any angle, an excellent clamp for general use.

Each .....

.40

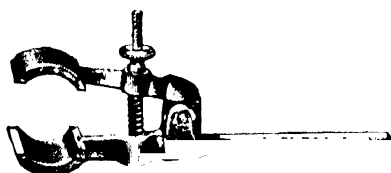
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C-11706

**C-11706 Clamps—Burette**

	No.	A	B	C
Size		Small	Large	Extra Large
Each		40	.55	.85



C-11714

**C-11714 Clamps—Burette—For holding burettes or tubes at any angle**

	No.	A	B	C
Size		Small	Medium	Large
Each		.35	.55	.60



C-11718



C-11720

**C-11718 Clamp Holders For attaching clamps, extension rings, ring burners, etc., to apparatus support**

	No.	A	B
Size		Small	Large
Each		.30	.35

**C-11720 Clamp Holders—Universal To set at any angle**

C-11795-11800

**C-11795 Clamps—Test Tube, Stoddard's—Of brass**

	No.	A	B
Size		Small	Large
Each		20	.25
Per dozen		2.25	2.65

**C-11800 Clamps—Test Tube, Stoddard's—Of nickel-plated spring wire**

	No.	A	B
Size		Small	Large
Each		.12	.15
Per dozen		1.20	1.50

Prices subject to change without notice



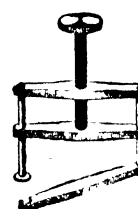
C-11785

**C-11785 Clamps—Test Tube—Of wood with spring.**

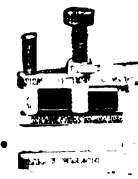
Each . . . . .22



C-11825



C-11830



C-11835

**C-11825 Clamps—Tubing, Hoffmann's—For rubber tubing, nickel plated**

	No.	A	B
Size		Small	Large
Each		.25	.30
Per dozen		2.80	3.20

**C-11830 Clamps—Tubing, Hoffmann's—Improved form; can be attached to tubing without disconnecting apparatus**

	No.	A	B
Size		Small	Large
Each		.27	.30
Per dozen		3.00	3.25

**C-11835 Clamps—Tubing, Hoffmann's—Improved form; can be attached to tubing without disconnecting apparatus**

	No.	A	B
Size		Small	Large
Each		.30	.32
Per dozen		3.20	3.50



C-11840

**C-11840 Clamps—Tubing, Mohr's Pinchcock—Of spring wire**

	No.	A	B	C	D
Size		Small	Medium	Large	Extra Large
Each		.13	.15	.18	.30
Per dozen		1.50	1.70	2.00	3.40

**C-11845 Clamps—Watch Glass—Of brass, nickel-plated, without watch glasses**

	No.	A	B
Size		Small	Large
Each		.25	.30
Per dozen		2.60	2.90

**C-11850 Clamps—Watch Glass, Bunsen's—Without watch glasses**

	No.	A	B
Diameter, mm		50	65
Each		.30	.35
Per dozen		2.90	3.25

Continued on Next Page

## COLORIMETERS

**Colorimeter—Lavibond Tintometer.**

This instrument furnishes a means by which the depth of color in liquids and solids can be accurately read in degrees, placed in their position in a permanent color scale, and registered for reproduction at any time.

Descriptive matter covering the different sets for various types of work will be sent upon request.



C-11880

**C-11880 Colorimeter—Dubosq, Bausch & Lomb**—An apparatus to measure color intensity of liquids by transmitted light, consists of heavy base and firm standard, assuring great stability and durability; base carries double reflector, one side silvered and the other opal, to give diffused illumination; standard carries on vertical surface two rack and pinion adjustments of regular microscope type for movement of cup or cylinder supports; pinion and operating heads are always in fixed location, so that readings are controlled only by observation and not by location of pinion heads; cups or cylinders have plano-parallel glass bottoms and are removable for easy cleaning; plungers, prisms and compound magnifier are attached to a bracket on upper part of standard; plungers are of selected optical glass, accurately ground and polished; prisms are of precise optical quality with fine central dividing line; compound magnifier is of four lens construction, adjustable for focusing; cover on front of instrument excludes all light from the cylinders except that reflected by illuminating mirror; scales on rear surface of standard are graduated in millimeters and provided with vernier readings to 1/10 mm; rack-stops prevent cylinder and plunger from forcible contact; supplied with series of colored glasses for modifying light from either or both cylinders; furnished in wood case, tubes and scales 50 mm long.

Each . . . . . 125.00

**C-11885 Colorimeter—Dubosq, Bausch & Lomb**—Similar to No. C-11880 above, but with tubes and scales 100 mm long.

Each . . . . . 165.00

**C-11881 Nephelometer Attachment for above**—With 250 watt Mazda lamp for complete conversion of No. C-11880 Dubosq Colorimeter into Nephelometer.

Each . . . . . 75.00

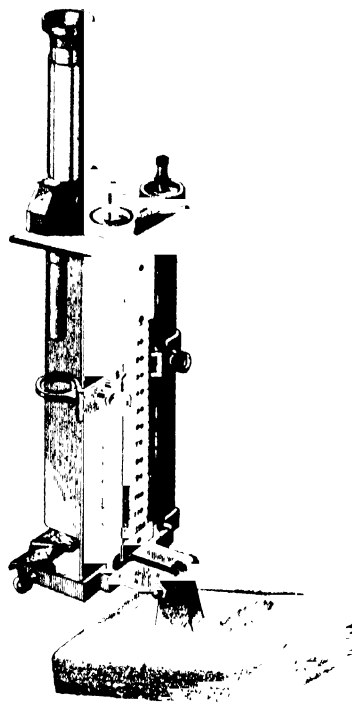
Prices subject to change without notice

**C-11886 Nephelometer Attachment for above**—Same as No. C-11881, but for a 100 mm size Dubosq.

Each . . . . . 90.00

**C-11887 Colorimeter Lamp**—With 100 watt gas-filled Mazda bulb in well ventilated housing; spherical glass mirror reflector and daylight glass window, with 6 ft cord switch and plug for 110 volt circuit.

Each . . . . . 19.50

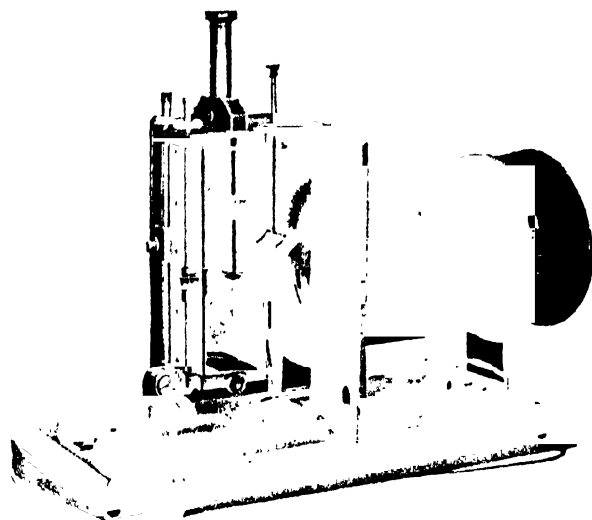


C-11907

**C-11907 Colorimeter—Kober's** A combination instrument for convenience of the analyst who may desire to use both colorimetry and nephelometry; cups containing the solutions are entirely separated from each other by dividing wall, thus eliminating the spattering of solutions from one cup into the other; extra heavy base keeps instrument in steady position; the movable verniers can be set at "zero" by simply loosening a thumb screw; the large brass scale is silvered to show the graduation more distinctly; prisms are attached to a separate plate for easy removal and cleaning; the mirror reflectors work independently of each other, and the reflected light can be so adjusted as to insure an absolutely even field; the dividing line in the "side-by-side" field is made as thin as possible to secure accurate readings; all plungers and cups have bottoms fused on to eliminate cement troubles permanently and will resist all acids, alkalis and heat; the stages travel on screw-threaded rods, which exceeds the old style rack and pinion method by eliminating lost motion and consequent inaccuracy; by attaching the instrument to a lighting source, it can be changed instantly into nephelometer, as the plungers are made of black glass tubing; all parts are made to be interchangeable; furnished with one pair of colorimetric cups and plungers.

Each . . . . . Net 85.00

Continued on Next Page



C 11912

- C-11912 Colorimeter—Nephelometer, Kober's**—Same as described under C-11907, but furnished with lamp house, as shown in illustration, one pair of short and one pair of long colorimetric cups, one pair of short and one pair of long nephelometric cups, stereopticon lamp, cord and plug, mounted on a black, polished board with switch.

Each ..... 120.00



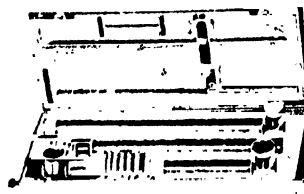
C 11889

- C-11889 Colorimeter—Biological Dubosq**—Constructed on the same principles as the Dubosq from an optical standpoint but reduced in size and simplified. Cup for standard solution is moved up and down by hand and clamped in any desired position by means of thumb screw. Movement of unknown by rack and pinion.

Scales in millimeters with verniers by which readings can be made to with 0.1 mm. Maximum depth of liquid is 40 mm. With light shield to exclude light and to protect instrument when not in use.

Each ..... Net 60.00  
Case for above, extra ..... 3.00

Prices subject to change without notice



C-18700

- C-18690 Colorimeter—U. S. Geological Survey Standard**—For determining color in water analysis, by comparing color of water under examination with that of series of glass disks, rated in color values according to the platinum-cobalt scale of parts of platinum per million, furnished complete, with four aluminum tubes, one with clips for holding disks, others 50, 100 and 200 mm long, respectively, for holding water to be tested—and six standard disks of amber-colored glass, mounted in aluminum, in compact morocco-covered case.

Each ..... Net 49.50

- C-18695 Turbidity Scale—U. S. Geological Survey Standard**—Of aluminum, 8 in. long and graduated in parts per million, to one end is attached a tape, 4 ft. long and similarly graduated, into other end is fastened a nickel-plated brass screw eye, containing a piece of rolled platinum wire to be viewed, depth of its disappearance to the eye indicates turbidity, complete in case.

Each ..... Net 9.00

- C-18700 Colorimeter and Turbidity Outfit**—Consists of Nos. C-18690 and C-18695 above, combined in morocco-covered case.

Each ..... Net 58.00



C-2180

- C-2180 Color Comparison Tubes—Nessler**—For the determination of ammonia in water; of clear, colorless glass, with polished bottom.

	No.	A	B	C	D
Graduated, cc	50	100	50-100	50	100-150
Each	.56	.67	.80	1.00	



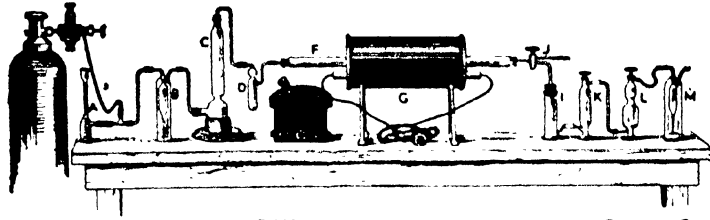
C-2185

- C-2185 Color Comparison Tubes—Nessler**—Tall form; with polished bottoms made from clear glass. The 50 cc mark on the 50 cc tube is between 200 and 250 mm from the bottom, and the 100 cc mark on the 100 cc tube between 275 and 325 mm from the bottom. Tubes in sets of six or twelve have the 50 cc or 100 cc mark within 6 mm of same height. See American Public Health Association, "Standard Methods of Water and Sewage Analysis," 1917.

	No.	A	B
Capacity, cc	50	100	
Each	.56	.75	
Set of 6	3.60	5.25	
Set of 12	7.50	11.25	

Continued on Next Page





C-315

**C-315 Combustion Apparatus—Fleming's** Carbon determinations by this method are very rapid and accurate, five minutes only being required for the combustion proper and a complete determination can be finished in ten minutes. Oxygen may be passed at very rapid rate without possibility of a loss of  $\text{CO}_2$  or moisture. One filling of absorption tube will last for over sixty combustions. Complete as illustrated without oxygen tank or regulator, with Hoskin's type FD 302 furnace and rheostat and silica tube, 24" x  $\frac{3}{4}$ " bore.

Each ..... Net 62 75

(Please state voltage and current when ordering.)

**Separate parts of above equipment.**

No. A	Mercury pressure gauge	Net 1 80
Each		
B	Washing bottle	Net 1 35
Each		
C	Calcium chloride jar	Net 2 00
Each		
D	Mercury valve	Net 70
Each		
E	Silica tube, 30" long by $\frac{7}{8}$ " i d	Net 5 75
Each		
F	Silica tube, 24" long by $\frac{3}{4}$ " i d	Net 4 00
Each		
G	Furnace, Hoskin's FD 302 without rheostat	Net 30 00
Each		
H	Rheostat for above	Net 12 00
Each		
I	Zinc jar	Net 70
Each		
J	Stopcock	Net 1 80
Each		
K	Phosphoric anhydride jar	Net 2 50
Each		
L	Fleming absorption tube	Net 3 20
Each		
M	Washing bottle	Net 1 35
Each		



C-5550

**C-5550 Combustion Boats—Coors porcelain, glazed throughout with exception of outside bottom surface. Can also be supplied unglazed.**

	No. 1	2	3	4
Length, mm	60	60	62	76
Width, mm	7	10	8	10
Height, mm	8	8	8	9
Each	Net .26	.26	.28	.29
	No. 6	7	8	
Length, mm	88	97	100	
Width, mm	12	18	20	
Height, mm	8	13	13	
Each	Net .30	.32	.34	

Prices subject to change without notice

**C-320 Combustion Boats—C. M. Johnson—**Of vitrified clay 120 x 15 mm for carbon in steel determination.  
Per dozen ..... Net 2 00

**C-323 Combustion Boats, Alundum.**

	No. A	B	C
Length, in	3 $\frac{1}{2}$	3 $\frac{1}{4}$	5
Width, in	1	$\frac{5}{8}$	$\frac{3}{4}$
Each	Net 30	.35	.40

**C-5565 Combustion Tubes—Coors porcelain, suitable for high temperature work, specially glazed desired.**

	No. 0	1	2	3	4
Diam. outside, mm	10	12 5	14	17	20
Diam. inside, mm	6	10 5	10	12	15
Length, mm	1000	1000	1000	1000	1000
Each	Net 6 72	6 72	6 72	7 56	8 40
	No. 5	5a	6	7	
Diam. outside, mm	28	30	38	60	
Diam. inside, mm	20	25	28	43	
Length, mm	1000	1000	1000	1000	
Each	Net 10 08	10 92	13 44	16 80	

If longer or shorter lengths are required add or subtract .01 of price for each centimeter.

**C-6065 Combustion Tubes—Vitreosil—Sand Surface—**With one end reduced for length of 75 mm to bore of 3 mm and outside diameter of 6 mm; for direct connection with rubber tubing, are a great convenience in eliminating one stopper connecting and minimizing the difficulty of maintaining a gas-tight combustion train.

	No. A	B	C	D	E	F
Length over						
all, mm	610	762	610	762	610	762
Bore, mm	19	19	22	22	25	25
Each	Net 6 95	8 25	7 45	8 95	8 35	10 00

**C-6070 Combustion Tubes—Vitreosil—**Same as No. C-6065 above, but glazed.

	No. A	B	C	D	E	F
Length over						
all, mm	610	762	610	762	610	762
Bore, mm	19	19	22	22	25	25
Each	Net 8 25	10 00	8 75	10 50	10 25	12 50

## CONDENSERS

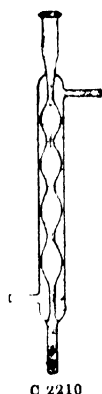


C-11995

**C-11995 Condensers—Soxhlet's—**Globe shape; of copper, nickel-plated, tinned inside.  
Each ..... 4 25

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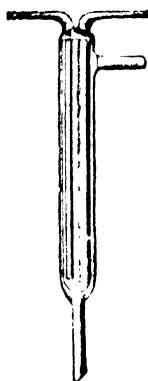
## CONDENSERS



C-2210



C-2215



C-2225

**C-2210 Condensers—Allihn's** Of glass, with bulb condensing tube

	No.	A	B	C	D	E
Length of Jacket, mm	200	250	300	400	450	
Each	1.00	1.15	1.30	1.50	1.70	

**C-2215 Condensers—Davies' Improved** A double surface condenser, the outflowing warm water does not heat the inflowing water

	No.	A	B	C
Length of Jacket, mm	150	200	300	
Each	4.10	4.50	5.40	

**C-2225 Condensers—Hopkin's Reflux** Excellent for extraction work Total length 350 mm

Each	3.15
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C-2240



C-2245



C-2250



C-2255

**C-2240 Condensers—Liebig's** Of glass, with loose inner tube and rubber connections

	No.	A	B	C	D	E	F
Length of Jacket, mm	250	300	400	450	500	600	
Each	.80	.90	.95	1.10	1.20	1.50	

Prices subject to change without notice

**C-2245 Condenser Tubes**—Of glass; with adapter for condenser No. C-2240.

	No.	A	B	C	D
Length of Jacket, mm	200	250	300	400	
Each	.20	.23	.25	.28	
	No.	E	F	G	
Length of Jacket, mm	450	500	600		
Each	.30	.32	.45		

**C-2250 Condensers—Liebig's**—Of glass, with inner tube sealed to body

	No.	A	B	C	D	E	F
Length of Jacket, mm	250	300	400	450	500	600	
Each	.90	1.00	1.15	1.35	1.50	1.80	

**C-2255 Condensers—Liebig's—(Graham's)**—Of glass; with condensing tube in form of coil sealed in water jacket

	No.	A	B	C	D	E
Length of Jacket, mm	150	200	250	300	400	
Each	1.00	1.15	1.30	1.60	2.10	

## CORKS

**C-12013 Corks—Regular Length, XXX Quality.**

Numbers	00	0	1	2	3	4
Diam., top, mm	8	9	10	11	12	14
Per gross	.31	.31	.31	.35	.42	.48
Numbers	5	6	7	8	9	10
Diam., top, mm	16	18	20	22	24	26
Per gross	.53	.58	.65	.90	1.10	1.25
Numbers	11	12	13	14	15	16
Diam., top, mm	28	29	30	31	32	34
Per gross	1.35	1.50	1.65	1.90	2.10	2.70
Numbers	17	18	20			
Diam., top, mm	36	38	40			
Per gross	2.90	3.15	3.75			

**C-12015 Numbers 1-6, assorted.**

Per gross	.45
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**C-12016 Corks—Regular Length, XXXX Quality.**

Numbers	00	0	1	2	3	4
Diam., top, mm	8	9	10	11	12	14
Per gross	.33	.33	.33	.40	.46	.56
Numbers	5	6	7	8	9	10
Diam., top, mm	16	18	20	22	24	26
Per gross	.65	.73	.87	1.10	1.35	1.55
Numbers	11	12	13	14	15	16
Diam., top, mm	28	29	30	31	32	34
Per gross	1.70	1.87	2.05	2.40	2.75	3.10
Numbers	17	18	20			
Diam., top, mm	36	38	40			
Per gross	3.65	3.95	4.55			

**C-12017 Numbers 1-6, assorted.**

Per gross	.55
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**C-12022 Corks—Short Form, XXX Quality.**

Numbers	00	0	1	2	3	4
Diam., top, mm	8	9	10	11	12	14
Per gross	.29	.29	.29	.32	.36	.40
Numbers	5	6	7	8	9	10
Diam., top, mm	16	18	20	22	24	26
Per gross	.46	.50	.58	.73	.87	1.08
Numbers	11	12	13	14	15	16
Diam., top, mm	28	29	30	31	32	34
Per gross	1.20	1.30	1.40	1.60	1.90	2.05
Numbers	17	18	20			
Diam., top, mm	36	38	40			
Per gross	2.20	2.40	2.85			

**C-12025 Corks—Short Form, XXXX Quality.**

Numbers	00	0	1	2	3	4
Diam., top, mm	8	9	10	11	12	14
Per gross	.31	.31	.31	.35	.39	.44
Numbers	5	6	7	8	9	10
Diam., top, mm	16	18	20	22	24	26
Per gross	.54	.58	.72	.87	1.05	1.30
Numbers	11	12	13	14	15	16
Diam., top, mm	28	29	30	31	32	34
Per gross	1.45	1.55	1.65	2.00	2.30	2.50
Numbers	17	18	20			
Diam., top, mm	36	38	40			
Per gross	2.65	2.90	3.40			

**C-12026 Numbers 1 to 6 assorted.**

Per gross . . . . .45

**C-12033 Corks—Flat, XXX Quality,  $\frac{5}{8}$ " long for wide mouth bottles, jars, etc**

No.	A	B	C	D	E	F
Diam., top, mm	50	53	56	59	62	65
Per dozen	.63	.72	.83	.94	1.05	1.20
No.	G	H	I	J	K	L
Diam., top, mm	68	71	75	81	87	93
Per dozen	1.40	1.50	1.70	2.15	2.60	3.10
No.	M	N	O	P	Q	
Diam., top, mm	100	112	125	138	150	
Per dozen	3.60	5.00	6.50	8.20	10.00	

**C-12040****C-12040 Cork Borers—Of hard brass.**

No.	A	B	C	D	E
Number in each set.	3	6	9	12	15
Per set	.60	1.15	1.90	2.85	4.10

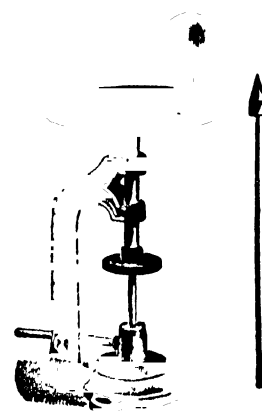
Prices subject to change without notice

**C-12045****C-12045 Cork Borers—Of polished, hard brass, best make; with handle to each borer**

No.	A	B	C	D	E
Number in each set	3	6	8	12	15
Sizes	1 3	1 6	1 8	1 12	1 15
Per set	.80	1.50	2.60	3.40	4.70

**C-12065****C-12065 Cork Press—Rotary** Rolls the corks into desired tapering shape without splitting them, supplied in two sizes for corks up to 18 and 32 mm diameter, respectively

No.	A	B
Size	Small	Large
Each	1.90	2.20

**C-12050****C-12050 Cork Boring Machine—Improved model for boring holes of any size in corks and rubber stoppers; has special device, not shown in illustration, for holding borers, so that their misplacement or loss is avoided, furnished complete with set of eight borers**

Each . . . . .Net 22.50

**C-12055****C-12055 Cork Borer Sharpener—Consists of a steel cone with knife.**

Each . . . . .1.95

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## CRUCIBLES

**C-335 Crucibles—Alundum**—For general work, not adapted for use where slags are formed. Without cover.

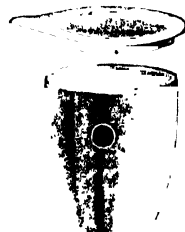
	No.	A	B	C
Capacity, cc	20	25	40	
Diameter, mm	38	45	46	
Height, mm	30	28	40	
Each	Net	.35	.40	.40

**C-340 Crucibles—Alundum—Porous**—For filtering, very rapid, supplied in 3 degrees of porosity, dense, medium, or porous.

	No.	A	B
Capacity, cc	25	35	
Diameter, mm	35	40	
Height, mm	38	42	
Each	Net	.35	.40



C-343



C-345

**C-343 Crucibles—Iron**—Of pure sheet iron, with lids.

	No.	A	B	C	D	E
Capacity, cc	20	50	100	200	400	
Diameter, in	1½	2½	2½	3½	3½	
Height, in	1¼	1½	2	2½	3	
Each	Net	.23	.30	.38	.52	.70

**C-345 Crucibles—Nickel**—High form with cover.

	No.	A	B	C	D	E	F
Capacity, cc	20	30	50	75	100	150	
Diameter, in	1½	1½	1½	2	2½	2½	
Height, in	1¾	1¾	2	2¼	2½	2¾	
Each	Net	.95	1.10	1.25	1.85	2.40	3.00



C-5570-80



C-5590

**C-5570 Crucibles**—High form, Coors porcelain, glazed throughout with exception of outside bottom surface, without cover.

	No.	000	00	0	1	1a
Diameter rim, mm	26	30	35	41	45	
Diam bottom, mm	12	14	17	20	21	
Height, mm	19	25	27	35	40	
Capacity, cc	5	10	15	30	40	
Each	Net	.11	.14	.18	.29	.34
	No.	2	3	4	5	
Diameter rim, mm	52	62	72	87		
Diam bottom, mm	25	30	34	40		
Height, mm	43	50	59	72		
Capacity, cc	57	95	155	280		
Each	Net	.36	.42	.54	.66	

Prices subject to change without notice

**C-5575 Covers** for the above

	No.	000	00	0	1	1a
Diameter, mm	32	35	42	47	50	
Each	Net	.06	.06	.06	.08	.11
	No.	2	3	4	5	
Diameter, mm	59	73	81	95		
Each	Net	.11	.14	.14	.18	

**C-5580 Crucibles**—Ohio porcelain, high form without cover.

	No.	000	00	0	1
Capacity about, cc	5	10	15	25	
Diameter about, mm	26	30	35	41	
Height about, mm	19	25	27	35	
Each		.09	.13	.16	.22
	No.	2	3	4	5
Capacity about, cc	57	95	155	280	
Diameter about, mm	52	62	72	87	
Height about, mm	43	50	59	72	
Each		.31	.39	.44	.55

**C-5585 Covers** for the above

	No.	000	00	0	1
Each		.05	.05	.05	.05
	No.	2	3	4	5
Each		.08	.13	.14	.17

**C-5590 Crucibles**—Low form, Coors porcelain, glazed throughout with exception of outside bottom surface, without cover.

	No.	0000	000	00	0	1
Diameter rim, mm	18	32	37	41	46	
Diam bottom, mm	8	13	15	15	18	
Height, mm	12	19	21	25	29	
Capacity, cc	2.5	8	12	17	30	
Each	Net	.11	.14	.18	.22	.30
	No.	2	3	4	5	
Diameter rim, mm	56	67	81	96		
Diam bottom, mm	18	23	29	35		
Height, mm	36	44	52	65		
Capacity, cc	50	90	145	265		
Each	Net	.41	.52	.60	.74	

**C-5595 Covers** for the above

	No.	0000	000	00	0	1
Diameter, mm	22	39	44	47	52	
Each	Net	.06	.06	.06	.08	.08
	No.	2	3	4	5	
Diameter, mm	65	76	88	107		
Each	Net	.12	.14	.18	.22	

**C-5600 Crucibles**—Ohio porcelain, low form, glazed inside and outside, without cover.

	No.	000	00	0	1
Capacity about, cc	8	12	17	25	
Diameter about, mm	32	37	41	46	
Height about, mm	19	21	25	29	
Each		.10	.13	.16	.22
	No.	2	3	4	5
Capacity about, cc	45	80	140	250	
Diameter about, mm	56	67	81	96	
Height about, mm	36	44	52	65	
Each		.30	.38	.43	.51

**C-5605 Covers** for the above

	No.	000	00	0	1
Each		.05	.05	.06	.08
	No.	2	3	4	5
Each		.08	.17	.17	.17

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C-5610-20

O-5635

**C-5610 Crucibles—Gooch—Coors porcelain, with perforated bottom, glazed throughout with exception of outside bottom surface**

	No. 2	2a	3	4
Diameter rim, mm	27	33	35	40
Diameter bottom, mm	18	20	22	25
Height, mm	30	33	40	43
Capacity, cc	10	20	25	35
Each	Net .36	.42	.48	.54

**C-5615 Covers for the above.**

	No. 2	2a	3	4
Diameter, mm	35	39	42	47
Each	Net .06	.06	.06	.08

**C-5620 Crucibles—Gooch—Ohio porcelain, glazed inside and outside, permanent perforated bottom, perforations 1/2 mm in diameter**

	No. 2	3	4
Capacity about, cc	10	25	35
Diameter about mm	27	35	40
Height about mm	30	40	43
Each	.25	.34	.43

**C-5625 Covers for the above**

	No. 2	3	4
Each	.05	.05	.06

**C-5630 Crucibles—Gooch—Coors porcelain, with two holes for suspending in extraction apparatus. Size No. 3, diameter rim, 35 mm; capacity, 25 cc**

Each	Net .48
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**C-5635 Crucibles—Coors porcelain, of special shape with large filtering surface, for bitumen determination. Size A, diameter rim, 45 mm; bottom, 35 mm; height, 24 mm; capacity, 40 cc.**

Each	Net .60
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**C-5675 Crucibles—Caldwell—Coors porcelain, without covers or perforated disk, glazed inside and outside, with open flange bottom to hold disk**

	No. 1	3
Diameter top, mm	33	39
Diameter bottom, mm	20	26
Height, mm	33	40
Capacity, cc	15	25
Each	Net .42	.48

**C-5680 Covers for above Caldwell Crucibles**

	No. 1	3
Diameter rim, mm	40	46
Each	Net .06	.08



O-5685

**C-5685 Perforated disks for Caldwell Crucibles and funnels, sizes 6 to 9 with beveled edges.**

	No. 1	2	3	4	5
Diameter rim, mm	18	20	22	25	30
Thickness, mm	2	2	2	3 1/2	4
Each	Net .23	.23	.24	.24	.28

	No. 6	7	8	9
Diameter rim, mm	38	50	60	75
Thickness, mm	4	4	4	4
Each	Net .36	.46	.54	.72

Prices subject to change without notice

O 6075

**C-6075 Crucibles—Vitreosil—Glazed on exterior and interior, absolutely uniform in composition, and do not vary in either chemical or physical characteristics, are superior to platinum in that they resist action of reducing Bunsen flame and may be used constantly with boiling aqua regia without loss of weight, may also be used for ash determinations in many cases where platinum or silver crucibles are unsatisfactory, are superior to the best porcelain, may be cooled rapidly and do not condense moisture on the surface when cooling**

	No. A	B	C	D
Approx capacity, cc	4	10	15	25
Height outside, mm	19	19	25	28
Diam at top outside, mm	26	41	41	48
Each	Net .65	.85	.85	1.00
Covers to fit, each	Net .55	.55	.55	.65

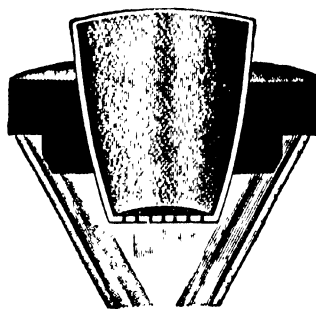
	No. E	F	G
Approx capacity, cc	40	65	145
Height outside, mm	37	44	51
Diam at top outside, mm	57	67	81
Each	Net 1.15	1.65	2.00
Covers to fit, each	Net .85	.85	.85



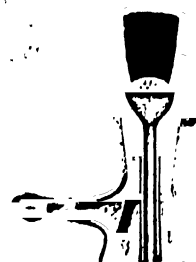
O-6080

**C-6080 Crucibles—Vitreosil—Glazed platinum shape**

	No. A	B	C
Approx capacity, cc	20	30	50
Height outside, mm	35	38	51
Diam at top outside, mm	35	43	51
Each	Net 1.35	1.35	1.65
Covers to fit, each	Net .55	.55	.65



C-12145



C-12155

**C-12145 Crucible Holders—Gooch, Bailey's—Accommodate a 25 cc. porcelain Gooch crucible; fit ordinary 2-in glass funnel, the upper edge projecting over the edge of the funnel, making the seal, lower edge of holder rests on side of funnel and supports holder when suction is on the flask; without funnel or crucible**

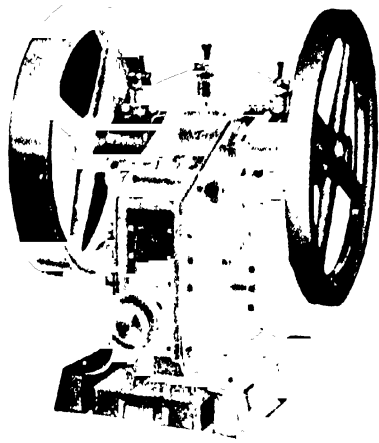
Each	.25
Per dozen	2.40

**C-12155 Crucible Holders—Gooch, Walter's—A combined rubber stopper and Gooch crucible holder that will fit neck of a filter flask up to 45 mm, outside diameter, is easily removed from flask, and economical; glass part is protected from breakage; with funnel**

Each	.45
Per dozen	4.50

Continued on Next Page

## CRUSHING, GRINDING AND PULVERIZING EQUIPMENT



C-355

**C-355 Crusher—Chipmunk, Type VC No. 12 Small Type.**  
Readily adjusted for coarse or fine crushing, easily cleaned, will reduce rock or coal from 2" down to  $\frac{1}{4}$ " and smaller at rate of 300 to 400 lb. per hour when hand fed. Opening of jaws  $2\frac{1}{4}$ " in. Power required 1 H.P. speed 300 R.P.M.

Each . . . . . Net 100.00

**C-357 Crusher—Chipmunk, Type VC No. 14 With tight and loose pulleys**  
Each . . . . . Net 110.00



C-360

**C-360 Crusher—Sturtevant—Laboratory Sample Grinder No. 0.** With six inch grinding plates and tight and loose pulleys, reduces  $\frac{1}{4}$ " and finer to about 100 mesh at the rate of about 100 lb. per hour, especially recommended for grinding coal, coke and dry materials; all parts easily accessible and circle of grinding surfaces may be changed by shifting the center of stationary disc so that cuts or scores on surfaces may grind themselves out. Weight about 150 lb. net, power required about 2 H.P., speed 1200 R.P.M., pulley 6" x 2 1/4"

Each . . . . . Net 110.00

**C-362 Extra set of semi steel discs.**  
Per set . . . . . Net 4.75

**C-363 Crusher—Sturtevant Laboratory Sample Grinder, No. 2.** Similar to the above but with ten inch grinding plates and of heavier construction, reduces  $\frac{1}{4}$ " and finer material to about 100 mesh at rate of 100 pounds per hour. Pulley 7" x 3", approximate horse power required 3 H.P., speed 750 R.P.M., net weight about 175 pounds

Each . . . . . Net 137.50

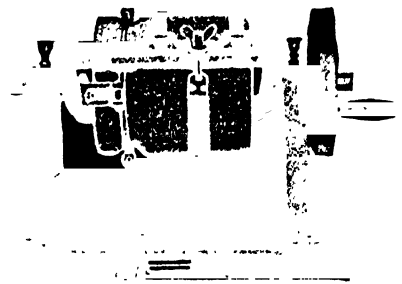
Prices subject to change without notice

**C-364 Extra set of Manganese Steel discs.**  
Per set . . . . . Net 25.00

**C-365 Extra set of Cast-iron discs**  
Per set . . . . . Net 10.00

**C-368 Crusher and Grinder—Ball Mill.** For reducing to very fine mesh any material either hard or soft, particularly those which must not come in contact with metal for grinding in a wet or dry stage, single specimen jar with one quart jar mounted, with pulley for power drive.

Each . . . . . Net 22.00



C-370

**C-370 Crusher and Grinder—Ball Mill.** Single assay mill for hand or power operation, jar 8 1/4 x 9 1/4 inches and capacity wet about one gallon.

Each . . . . . Net 50.00

Many other types of Crushing, Grinding and Pulverizing Equipment can be supplied. Let us know your requirements.

## CYLINDERS



C-2295



C-2310

**C-2295 Cylinders.** Of heavy glass. With enlarged top, especially adapted for use with hydrometers.

	No.	A	B	C
Height, mm. . . . .	350	300	400	
Diameter at top, mm. . . . .	50	75	75	
Diameter at bottom, mm. . . . .	40	50	65	
Each . . . . .	.70	1.00	1.25	

**C-2310 Cylinders.** Of heavy glass. With lip. Ungraduated.

	No.	C	D	E	G
Height, mm. . . . .	125	150	150	200	
Diameter, mm. . . . .	40	25	40	25	
Each . . . . .	.32	.32	.34	.36	

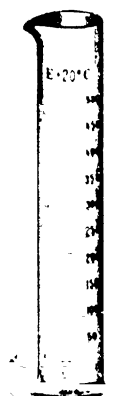
  

	No.	I	J	M	O
Height, mm. . . . .	210	250	300	350	
Diameter, mm. . . . .	40	40	50	50	
Each . . . . .	.38	.48	.54	.62	

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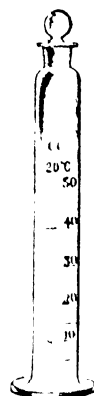
C-2315



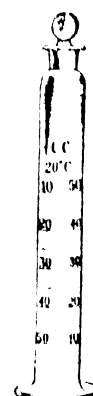
C-2320



C-2330



C-2355



C-2370



C-2380

C-2315 Cylinders—Graduated—With single graduations and lip, on foot

	No.	D	E	G	I	J
Capacity, cc	25	50	100	150	200	
Graduated, cc	1	1	1	1	2	2
Each	40	45	50	67	68	

	No.	K	M	N	O	P
Capacity, cc	250	500	1000	1500	2000	
Graduated, cc	2	5	10	20	20	
Each	70	100	145	315	360	

C-2320 Cylinders—Graduated—Graduated at 20°C to meet the requirements of the U. S. Bureau of Standards

	No.	B	C	D	E
Capacity, cc	10	25	50	100	
Graduated, cc	1/10	1/5	1/5	1	
Each	2.90	4.00	4.70	5.00	

	No.	F	G	H
Capacity, cc	250	500	1000	
Graduated, cc	5	5	10	
Each	6.20	8.25	9.75	

C-2330 Cylinders—Graduated—Double graduations, reading up and down, with lip, on foot

	No.	D	E	G	J
Capacity, cc	25	50	100	200	
Graduated, cc	1/2	1	1	2	
Each	45	55	65	90	

	No.	K	L	M	N
Capacity, cc	250	300	500	1000	
Graduated, cc	2	2	5	10	
Each	1.00	1.20	1.35	1.80	

C-2355 Cylinders—Mixing—With ground glass stopper, on foot, graduations reading up only.

	No.	C	D	E	H	K	L
Capacity, cc	25	50	100	250	500	1000	
Each	.85	1.00	1.15	1.75	2.35	3.25	

C-2360 Cylinders—Mixing—With glass stopper, graduated at 20°C to meet the requirements of the U. S. Bureau of Standards

	No.	B	C	D	E	F	G
Capacity, cc	25	50	100	250	500	1000	
Graduated, cc	1/5	1/5	1	5	5	10	
Each	4.10	5.80	6.50	5.50	9.75	11.25	

C-2370 Cylinders—Mixing—With ground glass stopper, on foot, graduated to read up and down.

	No.	C	D	E	F
Capacity, cc	25	50	100	150	
Each	.90	1.10	1.25	1.55	

	No.	H	K	L
Capacity, cc	250	500	1000	
Each	1.80	2.70	3.60	

C-2380 Cylinders—For Testing Sewage—Of conical shape throughout, graduated from tip up, at points from 0 to 100 cc. Total capacity, 1000 cc

Each ..... 2.60



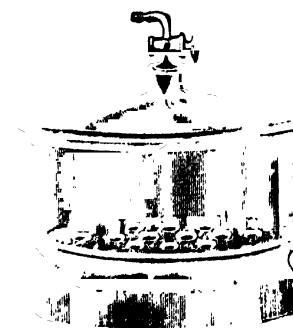
C-2410

C-2410 Desiccators—Fruehling and Schultz's—With glazed, perforated porcelain plate

	No.	A	B
Diameter, mm	200	250	
Each	10.50	17.20	

C-2412 Desiccators—Fruehling and Schultz's—Pyrex glass—With glazed porcelain plate 8" inside diameter

Each ..... Net 13.00



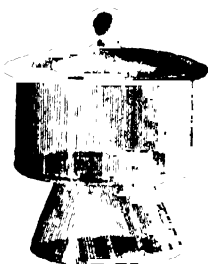
C-2415

**C-2415 Desiccators—Fruehling and Schultz's**—Same as No. C-2410 above, but with ground-in stopcock in lid. Not guaranteed for high vacuum.

	No.	A	B
Diameter, mm	200	250	
Each	14.50	21.00	

**C-2417 Desiccators—Fruehling and Schultz's**—Same as No. C-2415 above, but of Pyrex glass. 8" inside diameter, with plate.

Each	Net	19.50
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C-2430



C-2435



C-2455

**C-2430 Desiccators—Scheibler's**—With wide, finely ground flange, to which covers are accurately fitted.

	No.	A	B	C	D	E
Diameter, mm	100	125	150	200	250	
Each	1.15	1.70	2.15	5.70	15.00	

**C-2435 Desiccators—Scheibler's**—Vacuum, same as No. C-2430 above, but with ground-in, glass stopcock and hook in lid. Not guaranteed for high vacuum.

	No.	A	B	C
Diameter, mm	150	200	250	
Each	4.50	10.50	16.50	

**C-2455 Desiccators—Triangular**—Of heavy glass, designed for use in balance case; width of side, 2 in., height, 1½ in.

Each	.60
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**C-5705 Desiccator Plates—Coors porcelain, glazed on one side, on three small feet**

	No.	0	1	2	2a
Diameter, mm	85	95	115	120	
Number of holes	3	3	4	5	
Diameter of holes, mm	23	30	30	23	
Each	Net	.78	.90	1.02	1.14
	No.	2b	3	4	5
Diameter, mm	125	140	190	230	
Number of holes	8	5	7	8	
Diameter of holes, mm	23	30	30	50	
Each	Net	1.32	1.50	2.40	3.00

**C-5710 Desiccator Plates—Ohio porcelain, with holes, glazed on top, mounted on three small feet**

	No.	A	B	C	D	E
Diameter, mm	90	110	140	190	230	
Number of holes	3	4	5	6	8	
Diam. of holes, mm	26	26	26	26	26	
Thickness, mm	5	5	5	6	7	
Each	.65	.77	.95	1.55	1.80	

**C-5715 Desiccator Plates—Coors porcelain, glazed on one side, without feet.**

	No.	4	5
Diameter, mm	190	230	
Number of holes	7	8	
Diameter of holes, mm	30	30	
Each	Net	2.10	2.52

Prices subject to change without notice

**C-5722 Desiccator Plates—Coors porcelain, glazed on one side without feet, with numerous small holes, thumb hole in center**

	No.	3	4	5
Diameter, mm	140	190	230	
Thickness, mm	4	5	5	
Diameter of holes, mm	5	5	5	
Each	Net	1.68	2.28	2.70

**C-5725 Desiccator Plates—Ohio porcelain, with no feet, top glazed, protusely perforated**

	No.	A	B	C
Diameter, mm	140	190	230	
Diameter of holes, mm	5½	5½	5½	
Thickness, mm	5	6	7	
Each	1.05	1.70	2.10	

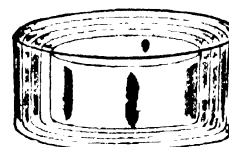
## DISHES



C-14875

**C-14875 Dishes—Aluminum**—For milk analysis, with flat bottom

	No.	A	B	C	D	E
Diameter, in	2	2½	3	3½	4	
Height, in	1	5/8	3/4	7/8	1	
Each	.23	.26	.35	.45	.53	



C-2470

**C-2470 Dishes—Crystallizing—Low Form**—Of resistance glass, with flat bottom and polished edges

	No.	A	B	C	D	E	F
Diameter, mm	40	50	60	70	80	90	
Height, mm	30	35	35	35	40	50	
Each	.12	.12	.13	.14	.15	.16	
	No.	G	I	J	K	L	M
Diameter, mm	100	125	150	170	190	215	
Height, mm	50	65	75	85	95	110	
Each	.20	.36	.48	.64	.80	.90	



C-2472

**C-2472 Dishes—Crystallizing—Pyrex.**

	No.	A	B	C	D
Diameter, mm	70	80	90	100	
Height, mm	50	40	50	50	
Each	.45	.40	.45	.55	
	No.	E	F	G	H
Diameter, mm	125	150	170	190	
Height, mm	65	75	90	100	
Each	.85	1.15	1.25	1.50	

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C-5730-40



C-5765

**C-5730 Dishes—Evaporating—**Coors porcelain, with lip, sizes up to 5 are glazed inside and outside with exception of rim, larger sizes are partly glazed outside

	No.	000	00	0	1	2	3
Diameter, mm		60	70	80	85	90	100
Height, mm		24	27	30	33	37	42
Capacity, cc		35	60	80	100	140	175
Each	Net	14	22	24	36	42	48
	No.	4	5	6	6a	7	8
Diameter, mm		110	120	145	162	185	215
Height, mm		43	50	48	51	54	63
Capacity, cc		210	300	385	535	765	1285
Each	Net	54	.66	84	96	108	144
	No.	8a	9	10	11	12	13
Diameter, mm		230	265	305	360	400	460
Height, mm		70	80	95	116	140	175
Capacity, cc		1430	2200	3250	5700	10000	16500
Each	Net	180	216	3.60	4.80	10.80	21.60

**C-5735 Dishes—Evaporating** Ohio porcelain, with lip, numbers 000 to 4 are entirely glazed, larger sizes are glazed inside, but only partly outside

	No. 000	00	0	1	2	3
Diam os., mm	60	70	80	85	90	100
Capacity, cc	35	50	80	100	140	175
Each	13	.16	.18	.21	.30	.34
	No. 4	5	5a	6	6a	6b
Diam os., mm	110	120	125	145	135	170
Capacity, cc	210	300	330	385	535	690
Each	39	47	51	60	.73	.67
	No 7	8	8a	9		
Diam os., mm	185	215	230	265		
Capacity, cc	765	1285	1430	2200		
Each	.82	1.02	1.50	1.62		
	No. 10	11	12	13		
Diam os., mm	305	360	400	460		
Capacity, cc	3250	5700	10000	16500		
Each	2.55	3.40	7.65	13.50		

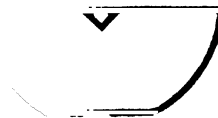
**C-5740 Dishes—Evaporating—**Coors porcelain, shallow form with lip, glazed inside but only partly outside.

	No. 000	1	2	3	4
Diameter, mm . . . . .	45	71	80	95	105
Height, mm . . . . .	15	17	20	23	30
Capacity, cc . . . . .	10	45	50	90	145
Each . . . . . Net	.18	.24	.30	.48	.60
	No. 5	5a	6	7	
Diameter, mm.....	120	128	140	160	
Height, mm . . . . .	34	34	40	48	
Capacity, cc . . . . .	195	225	325	530	
Each . . . . . Net	.72	.78	.90	1.08	

**C-5765 Dishes—Evaporating—**Ohio porcelain, flat bottom, for milk evaporation.

	No.	A	B	C
Diameter, mm . . . . .	40	43	72	
Height, mm. . . . .	7	11	16	
Each . . . . .	.09	.17	.39	

Prices subject to change without notice



C-2487

**C-2487 Dishes—Evaporating** Pyrex glass with flat bottom and lip

	No	A	B	C	D	E	F
Diameter, mm	80	90	105	125	150	200	
Height, mm	45	50	55	65	80	100	
Each	Net	.35	.40	.45	.75	1.00	1.30



C-380

**C-380 Dishes—Evaporating—**Nickel. Of pure sheet nickel with lip and flat bottom, highly polished

	No.	A	B	C	D
Capacity, cc . . .	40	100	200	300	
Diameter, in . . .	2	2 1/4	3 1/2	4	
Each . . . . .	1.30	1.70	2.55	3.40	

**Dishes—Evaporating** Platinum—See No. C-16385.



C-6105

**C-6105 Dishes—Evaporating** Vitreosil—Glazed—Flat, shallow form, with lip

	No.	B	C	D
Approximate capacity, cc		30	75	150
Diameter inside, mm		73	95	124
Depth inside, mm		13	18	21
Each	Net	1.65	1.85	2.50



C-6100

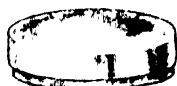
**C-6100 Dishes—Evaporating—**Vitreosil—Glazed—With lip; extremely durable and superior to the best porcelain; may be safely heated over naked flame

	No.	A	B	C	D	E	F
Approx capacity, cc	25	45	80	90	100	200	
Diameter inside, mm	51	70	82	89	98	109	
Depth inside, mm	21	25	30	22	30	44	
Each . . . . .Net	1.35	1.50	1.65	1.85	2.15	2.50	

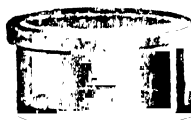
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**C-12180 Dishes—Lead**—For use in etching with hydrofluoric acid, etc.

No.	A	B	C	D	E
Diameter, mm	50	65	75	100	125
Each	12	16	20	32	53



C-2490



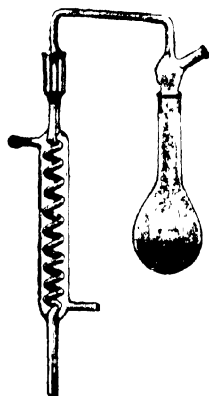
C-2495

**C-2490 Dishes—Petri**—Of resistance glass, with overlapping, loosely fitting glass covers.

No.	E	J	K
Diameter, mm	80	100	100
Depth, mm	10	10	15
Each	25	30	30

**C-2495 Dishes—Preparation—Stender's**—With grooved, accurately ground cover to fit.

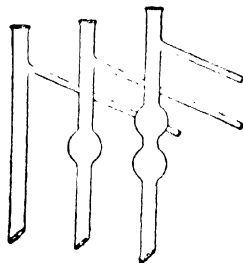
No.	A	B	C	D
Height, mm	24	30	35	90
Diameter, mm	36	50	60	60
Each	17	23	32	32



C-2510

**C-2510 Distilling Apparatus**—For the determination of ammonia in water, the connecting tube is provided with an inlet to allow of permanganate solution, being easily poured into the flask after free ammonia has been distilled off. A mercury seal connection with condenser insures a perfect joint and easy disconnection.

Each ..... 8.00



C-2515 20 25

**C-2515 Distilling Tubes**—For fractional distillation, plain form.

Each ..... .28

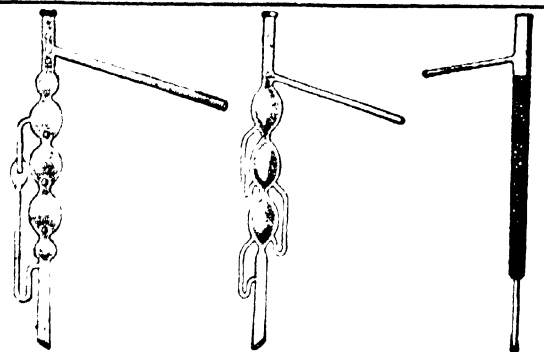
**C-2520 Distilling Tubes**—With one bulb.

Each ..... .30

**C-2525 Distilling Tubes**—With two bulbs.

Each ..... .38

Prices subject to change without notice



C-2530

C-2535

C-2540

**C-2530 Distilling Tubes—Ghinsky's**—With glass valves.

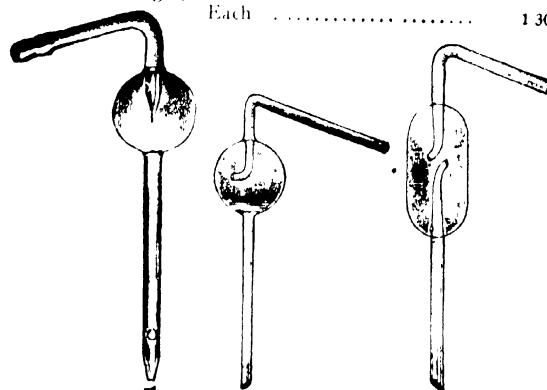
Each ..... 2.35

**C-2535 Distilling Tubes—LeBel-Henninger's.**

No.	A	B	C
Number of bulbs	2	3	4
Each	1.80	2.00	2.40

**C-2540 Distilling Tubes—Hempel's**—Filled with glass beads, length, 400 mm.

Each ..... 1.30



C-2545

C-2550

C-2560

**C-2545 Distilling Tubes—Hopkins'**—Safety form for rapid work in nitrogen determinations, with single, straight tubulation inside bulb.

Each ..... 1.15

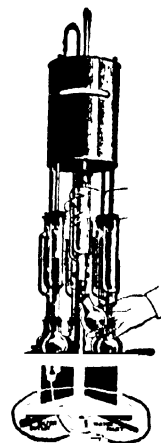
**C-2550 Distilling Tubes—Kjeldahl's**—Spherical form, with one bent connecting tube in bulb.

Each ..... .65

**C-2560 Distilling Tubes—Kjeldahl's**—Cylindrical form, with two curved connecting tubes in bulb.

Each ..... 1.10

## EXTRACTION APPARATUS



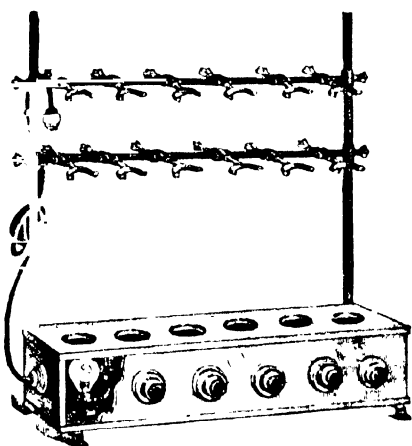
C-12805

**C-12805 Extraction Apparatus**—Revolving type to accommodate any style or type of glassware; sliding condensing tube obviates the necessity of removing corks when once placed, no valves or washers, adjustable in height, only requires about one square foot of space; no rubber tubing or clamps with condenser; only one connection at water inlet and outlet necessary; furnished for either 110 or 220 volt current direct or alternating, without glassware.

Each ..... Net 60.00

(Please specify voltage and current when ordering.)

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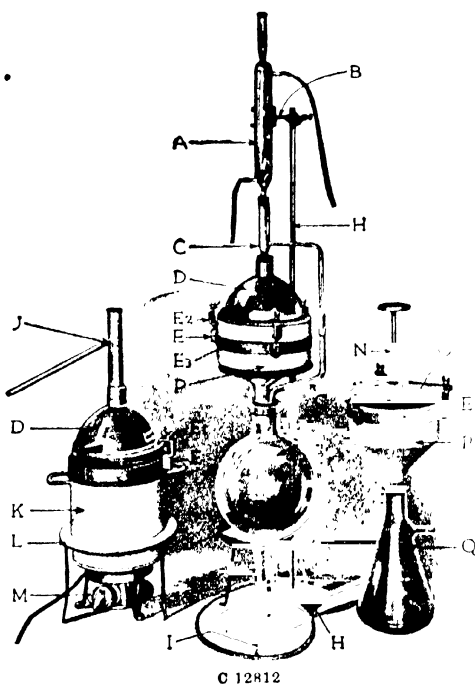


C 12810

**C-12810 Extraction Apparatus Heater.** Has set of six electric lamps, each with switch, enclosed in supporting chamber made of asbestos wood, 30 in. long x 5½ in. wide x 7 in. high, non upright supports have an extreme height of 31 in., horizontal rods are adjustable in height, provided with six sets of adjustable clamps for extractors and condensers.

Each ..... Net 75.00

(Please state voltage and current when ordering.)



C 12812

**Extractor—Will—Combination Equipment**—This is in reality a combination of standard equipment which, by the use of a few specially made parts, may be applied to the operations of extraction, distillation, sublimation, ordinary and pressure filtration on a comparatively large laboratory scale. It consists of a 200 mm. Buchner funnel with an upper ground edge and a Pyrex glass dome taken from a standard Pyrex vacuum pan. These are fitted together by means of a special adapter clamp frame either with or without rubber or cork gaskets between the dome and ex-

tractor body or Buchner. A metal Soxhlet condenser and side vapor tube may be used or a glass condenser with glass vapor tube having a rubber slip connection as shown in the illustration. This latter is to be preferred for corrosive liquids. The boiling flask may be of either 3 or 5 liter capacity, the same number 10 rubber stopper, fitting either flask. The progress of the extraction may be readily observed and the boiling of the liquid regulated to obtain a maximum degree of percolation through the material as a constant liquid level can be maintained in the extractor proper. At the completion of the extraction it is possible to draw down all liquid held by the material by the use of an ordinary Pyrex filtering flask without transfer. In the case of sticky or gummy material the use of the special filter press head is to be recommended.

The Pyrex vacuum pan is excellent for concentrating to a semi solid condition as the low pressure employed and the removable dome allow of easy transfer of the finished material.

The illustrations show three actual uses of this combination equipment, all parts of which may be utilized in other operations in the laboratory.

**C-12812-A Apparatus for Distillation, Sublimation and Concentration.** Consists of: Pyrex still head (D), Pyrex dome (D), Special "Will" adapter frame (E), Suberite ring (F), Water bath (K), Tripod for water bath (L), Electric hot plate, 3-heat (M), Pyrex vacuum pan (D-1).

Complete as illustrated, with accessories

Each ..... Net 32.50

**C-12812-A 1 Apparatus for Distillation, Sublimation and Concentration.** Same as No. C-12812-A, but without electric hot plate (M).

Complete, with accessories

Each ..... Net 22.50

**C-12812-B Apparatus for Extraction—Capacity 2 liters.** Consists of: Allihn's condenser (A), Universal clamp (B), External glass vapor tube (C), Pyrex dome (D), Special "Will" adapter frame (E), Buchner funnel (F), Pyrex round bottom flask, 3 liter capacity (G), Tripod support for flask (G), Extra large stand with ring set (H); Triple Bunsen burner (I).

Complete as illustrated, with accessories

Each ..... Net 36.00

**C-12812-B-1 Apparatus for Extraction.** Same as No. C-12812-B, but with Soxhlet globe tinned copper condenser instead of Allihn condenser, with accessories.

Each ..... Net 38.25

**C-12812-B-2 Apparatus for Extraction.** Same as No. C-12812-B, but with Soxhlet globe tinned copper condenser with copper vapor tube attached instead of Allihn's condenser and external glass vapor tube, with accessories.

Each ..... Net 38.25

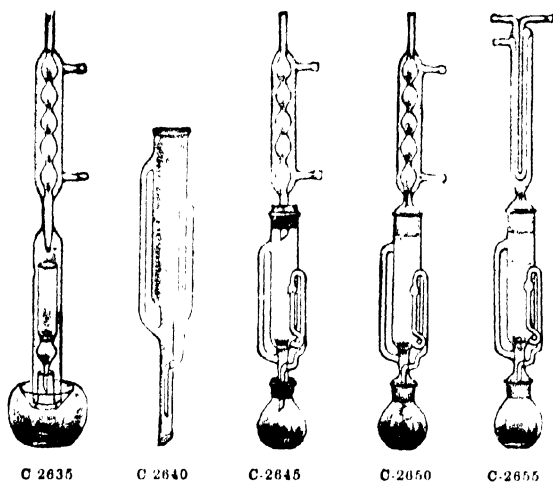
**C-12812-C Apparatus for Ordinary and for Pressure Filtration.** Consists of special "Snell" filter press head (N), Filter press head block (O), Special "Will" adapter frame (F), Buchner funnel (P), Pyrex filtering flask, two liter capacity (Q).

Complete as illustrated, with accessories

Each ..... Net 19.50

Prices subject to change without notice

Continued on Next Page



- C-2635 Extraction Apparatus—Knorr's** Complete with condenser, extraction tube and Knorr flask, 100 cc capacity, glass parts only, see U. S. Bureau of Chemistry circular No. 69  
Each ..... 6.00

- C-2640 Extraction Apparatus—Soxhlet's** Of clear, white glass, extraction tube only

No.	A	B	D
Approx. diameter of tube, mm	30	38	50
Approx. capacity to top of syphon, cc	70	100	200
Each	1.10	1.40	2.10

- C-2645 Extraction Apparatus—Soxhlet's** Complete with flask and condenser, fitted with best quality corks

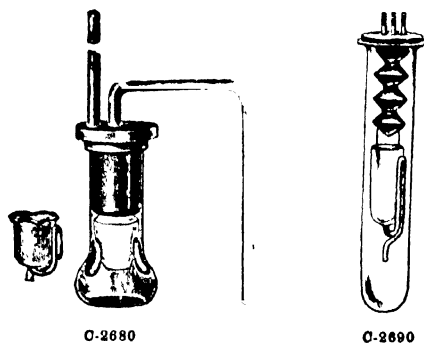
No.	A	B	D
Approx. diameter of tube, mm	30	38	50
Approx. capacity, cc	70	100	200
Each	2.90	3.10	4.00

- C-2650 Extraction Apparatus—Soxhlet's** With all joints ground air-tight, complete with three flasks and condenser

No.	A	B	C
Approx. diameter of tube, mm	30	38	50
Approx. capacity to top of syphon, cc	100	150	200
Each	4.00	4.50	5.40

- C-2655 Extraction Apparatus—Soxhlet's** Same as No. C-2650 above, but fitted with Hopkins' condenser instead of Allihn's bulb condenser

No.	A	B	C
Diameter of Soxhlet's tube, mm	30	38	50
Capacity, cc	60	100	200
Each	4.50	4.80	5.75



C-2680 C-2690

- C-2680 Extraction Apparatus—Bailey-Walker's**—Consisting of a metal condenser, small glass flask of special shape, and a small glass syphon cup. This is one of the most compact forms of extraction apparatus and can be used for any kind of work. The flask is light and can be accurately weighed and easily cleaned. Made according to the design of Bailey and Walker, of the U. S. Bureau of Chemistry. (See Journal of Industrial & Engineering Chemistry, 1914, vol. VI, p. 497.)

Each ..... 6.20

**Extra Metal Condenser.**

Each ..... 5.00

**Extra Syphon Cup.**

Each ..... .70

**Extra Gooch Crucible, Coors porcelain.**

Each ..... Net .48

**Extra Flask.**

Each ..... Net .50

- C-2690 Extraction Apparatus—Wiley-Richardson**—A simple form, recommended where a great deal of work is to be done on fats, oils, gums and resins, combines the simplicity and efficiency of the original Wiley apparatus with the maceration and percolation method of washing, as in the regular Soxhlet apparatus, complete with glass syphon cup, but without extraction thimbles.

Each ..... 7.50

**Extra Condenser.**

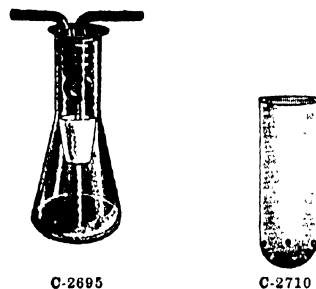
Each ..... 5.50

**Extra Syphon Cup.**

Each ..... .75

**Extra Tube.**

Each ..... 1.25



C-2695

C-2710

- C-2695 Extraction Apparatus—Cottle's**—Underwriter's Laboratories form; consists of metallic spiral reflux condenser, supporting a porcelain Gooch crucible by means of platinum or aluminum wire, all contained in specially designed, long neck Erlenmeyer flask, the entire apparatus being only 6 in. high and 3 in. wide; especially recommended for use in testing rubber compounds as used on wires and cords.

Each ..... 3.35

**Extra Condenser.**

Each ..... 2.55

**Extra Gooch Crucible, Coors porcelain.**

Each ..... Net .48

**Extra Flask, Pyrex glass.**

Each ..... Net .32

- C-2710 Extraction Thimbles**—Of glass; round bottom, with perforations.

No.	A	B	C
Height, mm	80	80	123
Diameter, mm	25	33	43
Each	.30	.45	.65

*Continued on Next Page*

Prices subject to change without notice

**C-12830 Extraction Shells—Alundum**—Constant in weight and may be used repeatedly. May be cleaned by immersion in strong acid and ignition. Can be supplied in three degrees of porosity.

	No. A	B	C	D	E
Height, mm	90	70	80	100	55
Diameter, mm	19	25	30	34	35
Shape of bottom	Flat	Flat	Flat	Round	Flat
Each	Net .60	.70	.75	.90	.80

**C-12835 Extraction Thimbles—Whatman's**—Made from the same high grade material as Whatman's Filter Paper and rendered fat free by a special process. Absolutely seamless and can be used repeatedly. Single and double thickness in sealed boxes of 25 thimbles.

	No. A	B	C	D
Size, mm	19 x 50	19 x 90	22 x 80	26 x 60
Per box of 25, single thick	3.15	3.15	3.15	3.15
Per box of 25, double thick	5.28	5.28	5.28	5.28
	No. E	F	G	H
Size, mm	25 x 80	30 x 77	33 x 80	33 x 94
Per box of 25, single thick	3.55	3.55	3.55	4.40
Per box of 25, double thick	5.92	5.92	5.92	7.36



C-12850

**C-12850 Fermentation Tubes**—On foot, ungraduated.

	No. A	B	C
Length, mm	145	170	195
Diameter, mm	13	15	17
Each	.27	.32	.36

Fermentation tubes of American Public Health Association Specifications as well as those without foot and with special graduation, can also be supplied. Prices on request.

C-12875

C-12880

**C-12875 Files—Round—Rat-tail**—Best quality.

	No. A	B	C	D
Length, mm	75	100	125	150
Each	.14	.16	.18	.20

**C-12880 Files—Triangular**—For cutting glass tubing, best quality.

	No. A	B	C	D
Length, mm	75	100	125	150
Each	.12	.14	.15	.18

**C-12885 File Handles**—For use with the above.

Each	.07
Per dozen	.75

## FILTER PAPER

**C-12940 Filter Paper—Will, White**—Circular filters; put up in packages of 100 filters and found by test to be equal to higher priced papers.

	No. A	B	C	D	E	F
Diameter, mm	55	70	90	110	125	150
Per hundred	.12	.15	.16	.21	.25	.32
	No. G	H	I	J	K	
Diameter, mm	185	240	270	320	385	
Per hundred	.40	.75	1.00	1.20	1.55	

**C-12945 Filter Paper—Will, White**—In sheets, 480 x 480 mm.

Per hundred	2.80
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**C-12950 Filter Paper—Will, Gray**—Circular filters, tough and durable.

	No. A	B	C	D
Diameter, mm	150	190	250	330
Per hundred	.40	.50	.85	1.10
	No. E	F	G	
Diameter, mm	400	450	500	
Per hundred	1.50	2.20	2.70	

**C-12955 Filter Paper—Will, Gray**—In sheets, 500 x 500 mm.

Per hundred	2.50
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**C-13015 Filter Paper—Whatman's No. 1**—High-grade filter paper for filtering ordinary precipitates in industrial laboratories, when ash weight of paper is of no consequence, widely used for determination of phosphorus, circular, furnished 100 in sealed box.

	No. A	B	C	D	E	F
Diameter, mm	42.5	55	70	90	110	125
Per 100	Net .16	.17	.20	.24	.28	.37
	No. G	H	I	J		
Diameter, mm	150	185	240	270		
Per 100	Net .51	.71	1.25	1.48		
	No. K	L	M	N		
Diameter, mm	320	385	400	500		
Per 100	Net 2.30	2.76	3.13	4.40		

**C-13020 Filter Paper—Whatman's No. 1**—Same quality as No. C-13015 above, but furnished in sheets, 46.5 x 57 cm.

Per ream of 480 sheets	Net 20.25
Per 100 sheets	Net 4.45

**C-13025 Filter Paper—Whatman's No. 2**—Similar to No. 1, but stouter, retains fine precipitates and filters rapidly.

	No. A	B	C	D	E	F
Diameter, mm	42.5	55	70	90	110	125
Per 100	Net .20	.21	.27	.34	.42	.52
	No. G	H	I	J		
Diameter, mm	150	185	240	270		
Per 100	Net .74	1.04	1.78	2.16		
	No. K	L	M	N		
Diameter, mm	320	385	400	500		
Per 100	Net 3.30	4.00	4.55	6.00		

**C-13030 Filter Paper—Whatman's No. 2**—Same quality as No. C-13025 above, but furnished in sheets.

	No. A	B
Size, cm	46.5 x 57	58.5 x 58.5
Per ream of 480 sheets	Net 31.10	40.00
Per 100 sheets	Net 6.85	8.80

**C-13065 Filter Paper—Whatman's No. 40**—Double acid-washed, all traces of silicious matter extracted by treatment with hydrochloric and hydrofluoric acids, very low ash, filters rapidly and retains fine precipitates.

	No. A	B	C	D
Diameter, mm	55	70	90	110
Per hundred	Net 1.10	1.20	1.70	2.00
	No. E	F	G	
Diameter, mm	125	150	185	
Per hundred	Net 2.30	2.70	3.60	

**C-13067 Filter Paper—Whatman's No. 41**—Double acid-washed but of more open texture than No. 40 and therefore filtering more rapidly. Desirable for silica, aluminum and iron determinations.

	No. A	B	C	D
Diameter, mm	55	70	90	110
Per hundred	Net 1.10	1.20	1.70	2.00
	No. E	F	G	
Diameter, mm	125	150	185	
Per hundred	Net 2.30	2.70	3.60	

Prices subject to change without notice

Continued on Next Page

**C-13070 Filter Paper—Whatman's No. 43**—"Ashless." Double acid-washed, having been subjected to treatment by hydrochloric and hydrofluoric acids to extract all traces of silicious matter, also to an additional chemical process which renders it fat free, very low ash, filters rapidly and retains fine precipitates, suitable for the recovery of the ether extract in the Roese-Gottlieb fat test, and for other purposes where the advantages of a fat-free paper are obvious, circular, furnished 100 in sealed box.

	No. A	B	C	D	E	F
Diameter, mm	55	70	90	110	125	150
Per 100	Net 1.35	1.50	2.20	2.25	2.28	3.60

**C-13072 Filter Paper—Whatman's No. 44** Double acid-washed and of thinner structure than No. 40 or No. 43, with lowest possible ash content. Recommended for use when greatest possible degree of accuracy is desired. Slightly slower in filtration than No. 40.

	No. A	B	C	D	E	F
Diameter, mm	55	70	90	110	125	150
Per 100	Net 1.35	1.50	2.20	2.55	2.80	3.60

**C-13075 Filter Paper—Whatman's No. 50** Specially hardened by treatment with nitric acid, very tough, resisting great pressure and retaining even finest precipitates, can be used repeatedly, hard, smooth surface permitting precipitates to be scraped or washed off without injury to paper; especially adapted for use with vacuum.

	No. A	B	C	D	E	F
Diameter, mm	42.5	55	70	90	110	125
Per 100	Net .55	.90	1.20	1.70	2.00	2.30

	No. G	H	I	J
Diameter, mm	150	185	240	270
Per 100	Net 2.70	3.60	6.10	7.30

	No. K	L	M	N
Diameter, mm	320	385	400	500
Per 100	Net 11.35	13.75	15.75	20.85

**C-12973 Filter Paper—Munktell's No. 00**—A double acid-washed filter paper of a specially low ash content for the most exacting work. In packages of 100.

	No. A	B	C	D
Diameter, mm	55	70	90	110
Per hundred	Net 1.50	1.65	2.40	3.00

	No. E	F	G
Diameter, mm	125	150	185
Per hundred	Net 3.30	3.75	6.30

**C-12974 Filter Paper Munktell's No. 0** Washed with hydrochloric acid, of very low ash content. Will retain the finest precipitates although comparatively rapid filtering. An excellent filter for general quantitative work.

	No. A	B	C	D
Diameter, mm	55	70	90	110
Per hundred	Net .60	.81	1.26	1.65

	No. E	F	H
Diameter, mm	125	150	185
Per hundred	Net 1.89	2.55	3.75

**C-12975 Filter Paper—Munktell's, No. 1F**—Unwashed paper of finest quality, very strong and adapted to highest class of chemical work; finest precipitates are retained; circular, furnished 100 in a package.

	No. A	B	C	D
Diameter, mm	55	70	90	110
Per hundred	Net .33	.48	.75	.90

	No. E	F	G
Diameter, mm	125	150	185
Per hundred	Net 1.20	1.50	2.25

**C-12980 Filter Paper—Munktell's, No. 1F**—Same quality as No. C-12975 above, but furnished in full sheets, 48 x 48 cm.

Per ream of 480 sheets	Net 60.00
Per quire of 24 sheets	Net 3.60

**C-12985 Filter Paper—Munktell's, No. 2**—A pure, white linen paper of medium thickness, not so closely made and therefore more rapid in filtration; a superior paper for all laboratory work, circular, furnished 100 in a package.

	No. A	B	C	D
Diameter, mm . . . . .	55	70	90	110
Per hundred . . . . .	Net .30	.39	.60	.78
	No. E	F	G	
Diameter, mm . . . . .	125	150	185	
Per hundred . . . . .	Net .93	1.20	1.59	

**C-12990 Filter Paper—Munktell's, No. 2**—Same quality as No. C-12985 above, but furnished in full sheets, 48 x 48 cm.

Per ream of 480 sheets	Net 51.00
Per quire of 24 sheets	Net 3.00

**C-13078 Filter Paper—A. D. Little**—A general purpose, quantitative filter paper, double acid-washed and of very low ash content. Comparatively rapid but will retain very fine precipitates, uniformity absolute, in one grade only, in sealed boxes of 100 sheets.

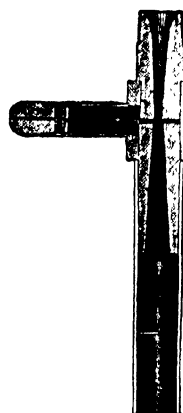
	No. A	B	C	D	E
Diameter, mm	70	90	110	125	150
Per hundred	Net 1.20	1.70	2.00	2.30	2.70

**C-5780 Filter Plates**—Ohio porcelain, Hirsch, profusely perforated, edges beveled to fit 60° funnels.



C-5780

	Size No. 1	2	3
Diameter, mm	.25	.38	.50
Each	.17	.22	.26



C-13090



C-13100



C-13105

**C-13090 Filter Pumps—Chapman's**—Made of brass and operated under ordinary water pressure; a very powerful pump.

	No. 1	2	3
Each	1.70	1.90	2.10

**C-13095 Filter Pumps—Chapman's, Couplings for**—When ordering, state size of pump for which coupling is desired.

No. A. For threaded faucet.	
Each	.40
No. B. For smooth faucet.	
Each	.60

**C-13100 Filter Pumps**—Constructed on entirely new design, to produce a higher vacuum in less time and using one-third less water than any other pump made.

	No. A	B	C
Size	Small	Medium	Large
Each	1.70	1.90	2.10

**C-13105 Filter Pumps—Richard's**—Made of brass and used with water pressure only; very powerful.

	No. A	B	C
Size	Small	Large	Extra Large
Each	1.70	3.00	8.50

Prices subject to change without notice

Continued on Next Page

**C-12830 Extraction Shells—Alundum**—Constant in weight and may be used repeatedly. May be cleaned by immersion in strong acid and ignition. Can be supplied in three degrees of porosity.

	No. A	B	C	D	E
Height, mm	90	70	80	100	55
Diameter, mm	19	25	30	34	35
Shape of bottom	Flat	Flat	Flat	Round	Flat
Each	Net .60	.70	.75	.90	.80

**C-12835 Extraction Thimbles—Whatman's**—Made from the same high grade material as Whatman's Filter Paper and rendered fat free by a special process. Absolutely seamless and can be used repeatedly. Single and double thickness in sealed boxes of 25 thimbles.

	No. A	B	C	D
Size, mm	19 x 50	19 x 90	22 x 80	26 x 60
Per box of 25, single thick	3.15	3.15	3.15	3.15
Per box of 25, double thick	5.28	5.28	5.28	5.28
	No. E	F	G	H
Size, mm	25 x 80	30 x 77	33 x 80	33 x 94
Per box of 25, single thick	3.55	3.55	3.55	4.40
Per box of 25, double thick	5.92	5.92	5.92	7.36



C-12850

**C-12850 Fermentation Tubes**—On foot, ungraduated.

	No. A	B	C
Length, mm	145	170	195
Diameter, mm	13	15	17
Each	.27	.32	.36

Fermentation tubes of American Public Health Association Specifications as well as those without foot and with special graduation, can also be supplied. Prices on request.

C-12875

C-12880

**C-12875 Files—Round—Rat-tail**—Best quality.

	No. A	B	C	D
Length, mm	75	100	125	150
Each	.14	.16	.18	.20

**C-12880 Files—Triangular**—For cutting glass tubing, best quality.

	No. A	B	C	D
Length, mm	75	100	125	150
Each	.12	.14	.15	.18

**C-12885 File Handles**—For use with the above.

Each	.07
Per dozen	.75

## FILTER PAPER

**C-12940 Filter Paper—Will, White**—Circular filters; put up in packages of 100 filters and found by test to be equal to higher priced papers.

	No. A	B	C	D	E	F
Diameter, mm	55	70	90	110	125	150
Per hundred	.12	.15	.16	.21	.25	.32
	No. G	H	I	J	K	
Diameter, mm	185	240	270	320	385	
Per hundred	.40	.75	1.00	1.20	1.55	

**C-12945 Filter Paper—Will, White**—In sheets, 480 x 480 mm.

Per hundred	2.80
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**C-12950 Filter Paper—Will, Gray**—Circular filters, tough and durable.

	No. A	B	C	D
Diameter, mm	150	190	250	330
Per hundred	.40	.50	.85	1.10
	No. E	F	G	
Diameter, mm	400	450	500	
Per hundred	1.50	2.20	2.70	

**C-12955 Filter Paper—Will, Gray**—In sheets, 500 x 500 mm.

Per hundred	2.50
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**C-13015 Filter Paper—Whatman's No. 1**—High-grade filter paper for filtering ordinary precipitates in industrial laboratories, when ash weight of paper is of no consequence, widely used for determination of phosphorus, circular, furnished 100 in sealed box.

	No. A	B	C	D	E	F
Diameter, mm	42.5	55	70	90	110	125
Per 100	Net .16	.17	.20	.24	.28	.37
	No. G	H	I	J		
Diameter, mm	150	185	240	270		
Per 100	Net .51	.71	1.25	1.48		
	No. K	L	M	N		
Diameter, mm	320	385	400	500		
Per 100	Net 2.30	2.76	3.13	4.40		

**C-13020 Filter Paper—Whatman's No. 1**—Same quality as No. C-13015 above, but furnished in sheets, 46.5 x 57 cm.

Per ream of 480 sheets	Net 20.25
Per 100 sheets	Net 4.45

**C-13025 Filter Paper—Whatman's No. 2**—Similar to No. 1, but stouter, retains fine precipitates and filters rapidly.

	No. A	B	C	D	E	F
Diameter, mm	42.5	55	70	90	110	125
Per 100	Net .20	.21	.27	.34	.42	.52
	No. G	H	I	J		
Diameter, mm	150	185	240	270		
Per 100	Net .74	1.04	1.78	2.16		
	No. K	L	M	N		
Diameter, mm	320	385	400	500		
Per 100	Net 3.30	4.00	4.55	6.00		

**C-13030 Filter Paper—Whatman's No. 2**—Same quality as No. C-13025 above, but furnished in sheets.

	No. A	B
Size, cm	46.5 x 57	58.5 x 58.5
Per ream of 480 sheets	Net 31.10	40.00
Per 100 sheets	Net 6.85	8.80

**C-13065 Filter Paper—Whatman's No. 40**—Double acid-washed, all traces of silicious matter extracted by treatment with hydrochloric and hydrofluoric acids, very low ash, filters rapidly and retains fine precipitates.

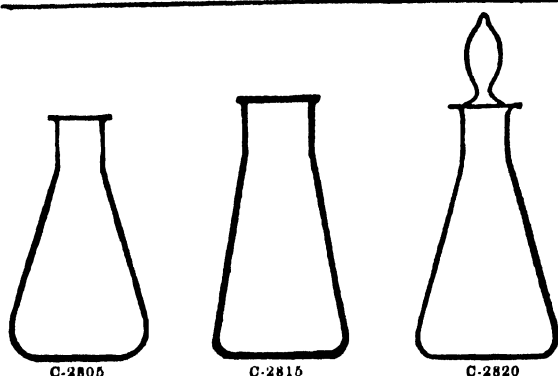
	No. A	B	C	D
Diameter, mm	55	70	90	110
Per hundred	Net 1.10	1.20	1.70	2.00
	No. E	F	G	
Diameter, mm	125	150	185	
Per hundred	Net 2.30	2.70	3.60	

**C-13067 Filter Paper—Whatman's No. 41**—Double acid-washed but of more open texture than No. 40 and therefore filtering more rapidly. Desirable for silica, aluminum and iron determinations.

	No. A	B	C	D
Diameter, mm	55	70	90	110
Per hundred	Net 1.10	1.20	1.70	2.00
	No. E	F	G	
Diameter, mm	125	150	185	
Per hundred	Net 2.30	2.70	3.60	

Prices subject to change without notice

Continued on Next Page

**C-2805 Flasks—Erlenmeyer—Pyrex.**

	No.	A	B	C	D	E	F
Capacity, cc	25	50	100	150	200	250	
For rubber stopper No.	00	1	3	4	5	5	
No. orig. case	360	276	180	252	144	132	
Each . . . . . Net	.16	.16	.18	.18	.20	.22	
In full case lots, less 10% discount.							
	No.	G	H	I	J	K	L
Capacity, cc	300	500	600	750	1000	1500	
For rubber stopper No.	6	6	6	7	8	9	
No. orig. case	132	72	60	48	36	24	
Each . . . . . Net	.25	.29	.31	.34	.42	.51	
In full case lots, less 10% discount.							
	No.	M	N	O	P		
Capacity, cc	2000	3000	4000	6000			
For rubber stopper No.	10	10	10	10			
No. orig. case	24	15	12	6			
Each . . . . . Net	.60	.79	1.00	1.60			
In full case lots, less 10% discount.							

**C-2810 Flasks—Erlenmeyer—Resistance Glass.**

No.	F	J	L	N	O
Capacity, cc	200	500	1000	2000	3000
Each	Net .22	.30	.44	.62	.80

**C-2815 Flask—Erlenmeyer—Pyrex—With wide mouth**

	No.	A <sup>1</sup>	A <sup>2</sup>	A	B
Capacity, cc		50	100	250	500
For rubber stopper No.		6	7	8	10
No. in original case		216	216	132	60
Each	.....	Net .16	.18	.22	.29
In full case lots, less 10% discount					

	No.	C	D	E
Capacity, cc		750	1000	2000
For rubber stopper No.		10	11	13
No. in original case		48	36	24
Each	.....	Net .34	.42	.60
In full case lots, less 10% discount				

**C-2820 Flasks—Erlenmeyer—Resistance Glass—With ground-in, glass stopper**

No.	A	B	C
Capacity, cc	125	250	500
Each	Net .36	.48	.60

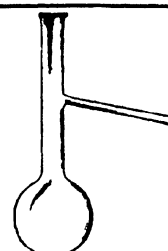
These can also be supplied in Pyrex glass  
Prices on application

**C-2835 Flasks—Copper Determination—Pyrex—With cylindrical neck and flaring top**

No.	A	B
Capacity, cc	180	250
For rubber stopper No.	5	6
No. in original case	144	108
Each	Net .25	.30
In full case lots, less 10% discount.		

C-2835

Prices subject to change without notice



C-2845-80

**C-2845 Flasks—Distilling—Pyrex—With side tube at center of neck**

Capacity, cc	No. A	B	C	D	E
No. in original case	25	50	100	125	200
For rubber stopper	84	60	54	48	54
No.	1	1	2	3	3
Each	Net .36	.40	.45	.50	.55
In full case lots, less 10% discount					
Capacity, cc	No. F	G	H	H <sup>1</sup>	I
No. in original case	250	300	500	700	1000
For rubber stopper	24	36	21	15	12
No.	3	4	4	6	6
Each	Net .60	.65	.70	1.00	1.18
In full case lots, less 10% discount					
Capacity, cc	No J	K	L		
No. in original case	1500	2000	3000		
For rubber stopper	9	6	6		
No.	7	9	10		
Each	Net 1.45	1.60	2.15		
In full case lots, less 10% discount					

These flasks can be supplied with side tube either high or low on neck if specified at same prices

**C-2880 Flasks—Distilling—Engler's—Pyrex—For oil distillation, of standard dimensions**

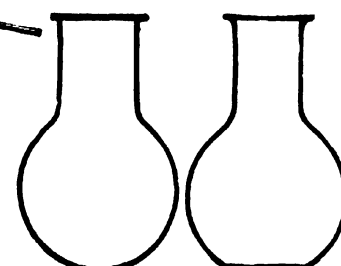
No.	A	B	C
Capacity, cc	100	200	250
For rubber stopper No.	1	2	2
No. in original case	54	48	48
Each	Net .60	.65	.70
In full case lots, less 10% discount.			

**C-2891 Flask—Distilling—Ladenburg's—Pyrex**

No.	A	B	C
Capacity cc	125	250	500
Each	Net 1.20	1.70	2.40



C-2891



C-2920

C-2925

**C-2920 Flasks—Extraction—Pyrex—Round bottom; with wide neck and vial mouth.**

No.	A	B
Capacity, cc	100	2000
For rubber stopper No.	6	13
No. in original case	120	18
Each	Net .18	.69
In full case lots, less 10% discount.		

**C-2925 Flasks—Extraction—Pyrex—Flat bottom, with wide neck and vial mouth.**

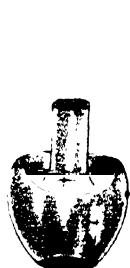
No.	A	B	C	D
Capacity, cc	50	100	150	250
For rubber stopper No.	6	6	7	8
No. in original case	168	120	108	120
Each	Net .16	.18	.19	.20
In full case lots, less 10% discount.				

Continued on Next Page



	No.	E	F	G	H
Capacity, cc	500	750	1000	2000	
For rubber stopper No	10	10	11	13	
No. in original case	60	48	36	18	
Each	Net	.29	.36	.54	.98

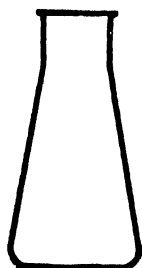
In full case lots, less 10% discount



C-2935



C-2940



C-2945

**C-2935 Flasks—Extraction—Knorr's**—With indentation for mercury seal

	No.	A
Capacity, cc	100	
Each	Net	.65

**C-2940 Flasks—Extraction—Sy's**—With trough for mercury seal, with large neck to facilitate cleaning

	No.	A	B	C	D
Capacity, cc	100	150	200	250	
Each	Net	.80	1.05	1.15	1.30

**C-2945 Flasks—Rubber Extraction—Pyrex**—Capacity 400 cc., for rubber stopper No. 9, 72 in original case

Each	Net	.32
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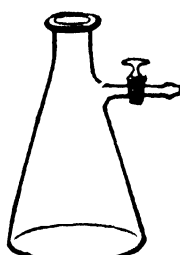
In full case lots, less 10% discount



C-2950



C-2960



C-2970

**C-2950 Flasks—Filtering—Pyrex**—Erlenmeyer form; of heavy glass to withstand pressure

	No.	A	B	C	D	E
Capacity, cc	250	500	1000	2000	4000	
For rubber stopper No	6	6	7	9	9	
No. in original case	120	72	30	20	9	
Each	Net	.40	.54	.84	1.20	2.00

In full case lots, less 10% discount

**C-2960 Flasks—Filtering—Pyrex**—Of heavy glass to withstand pressure, with side neck

	No.	A	B	C	D	E
Capacity, cc	250	500	1000	2000	4000	
For rubber stopper No	6	6	7	9	9	
No. in original case	96	60	24	15	16	
Each	Net	.70	.95	1.45	2.40	4.00

In full case lots, less 10% discount

**C-2965 Flasks—Filtering**—Same as No. C-2960 above, but of resistance glass.

	No.	A	B	D	E	F
Capacity, cc	250	500	1000	2000	4000	
Each	Net	.56	.76	1.16	1.92	3.20

Prices subject to change without notice

**C-2970 Flasks—Filtering**—Same as No. C-2965 above, but with side neck fitted with glass stopcock.

	No.	A	B	C	D
Capacity, cc	250	500	1000	2000	
Each	Net	1.40	1.70	2.80	4.00



C-2985



C-2990



C-2995

**C-2985 Flasks**—For iodine determinations

	No.	A	B	C
Capacity, cc	125	250	500	
Each	Net	1.00	1.20	1.50

**C-2990 Flasks—Kjeldahl's—Pyrex**—Round bottom, with long neck

	No.	A	B	C	D
Capacity, cc	300	500	650	800	
Length over all, mm	290	320	320	380	
For rubber stopper No	5	6	6	7	
No. in original case	60	36	36	36	
Each	Net	.28	.37	.42	.45

In full case lots, less 10% discount.

**C-2995 Flasks—Kjeldahl's—Pyrex**—Flat bottom, with long neck

	No.	A	B
Capacity, cc	300	500	
Length over all, mm	260	300	
For rubber stopper No	5	6	
No. in original case	60	36	
Each	Net	.28	.37

In full case lots, less 10% discount

**C-3000 Flasks—Kjeldahl's—Pyrex**—Round bottom; with short neck

	No.	A	B	C
Capacity, cc	300	500	800	
Length over all, mm	230	240	275	
For rubber stopper No	5	6	7	
No. in original case	60	36	36	
Each	Net	.28	.37	.45

In full case lots, less 10% discount



C-3020



C-3036

**C-3020 Flasks—Johnson's—Pyrex**—For sulfur determination in iron and steel analysis, with heavy ring neck, capacity, 275 cc.; for rubber stopper No. 6; number in original case, 108

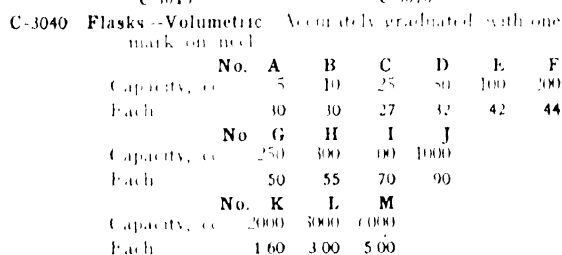
Each	Net	.32
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In full case lots, less 10% discount

**C-3036 Flask—Viscosimeter**—Of Pyrex glass, graduated; with mark at 60 cc.

Each	Net	1.25
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Continued on Next Page



**Prices on application**

- C-3045 Flasks—Volumetric.** Graduated to meet the requirements of the U. S. Bureau of Standards, adjusted for containing

No.	A	B	C	D	E	F
Capacity, cc	50	100	250	500	1000	2000
Each	1.45	1.80	2.15	2.70	4.00	4.70

- C-3050 **Flasks**—Volumetric Same as No C-3045 above, but adjusted for delivering

No.	A	B	C	D	E	F
Capacity, cc	50	100	250	500	1000	2000
Each	1.45	1.80	2.15	2.70	4.00	4.70

- C-3065 **Flasks**—Volumetric—Same as No. C-3040 above, but with ground-glass stopper

	No.	A	B	C	D	E	F
Capacity, cc	5	10	25	50	100	200	
Each	50	50	42	50	72	75	

	No.	G	H	I	J
Capacity, cc	250	300	500	1000	
Each	80	85	95	110	

Each	50	50	100	100
	No. K	L	M	
Capacity, cc	2000	3000	6000	
Each	1.80	3.50	5.75	

These can also be supplied in Pyrex glass

Prices on application

- C-3070 Flasks — Volumetric** — With ground-glass stopper, graduated to meet the requirements of the U. S. Bureau of Standards, adjusted for containing

No.	A	B	C	D	E	F
Capacity, cc	50	100	250	500	1000	2000
Each	1.95	2.50	3.25	4.00	5.40	6.50

- C-3075 **Flasks—Volumetric**—Same as No. C-3070 above but adjusted for delivering

	No.	A	B	C	D	E	F
Capacity, cu	50	100	250	500	1000	2000	
Each		1.95	2.50	3.25	4.00	5.40	6.50

- C-3095 Flasks**—Volumetric with two marks on neck, graduated for containing and delivering exact quantities, with ground-glass stopper.

	No.	C	E	F	G	H
Capacity, cc . . . . .	100	250	500	1000	2000	
Each . . . . .	1.10	1.15	1.50	1.70	2.25	

- C-3110 Flasks -- Volumetric--Giles'** With two graduation marks and ground glass stopper, when used for making normal solutions the 10% extra volume in the neck of the flask is used for ascertaining exact titration, leaving a volume equivalent to the exact capacity of flask for correction.

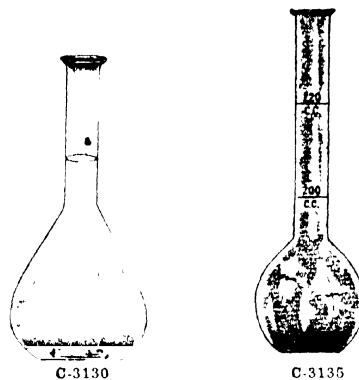
	No	B	C	D
Capacity, cc	100	10	250	25
Each	1	150	1.75	1.95

	No	E	F
Capacity, cc	1000	100	2000 200
Exch		2.70	4.00

- C-3115 Flasks — Volumetric — Kohlrausch's For saccharo-
- 
- metric polarization, graduated

	No. B	D	E	F
Capacity, cc	100	200	200 G	201 2
Each	.45	.75	.75	.75

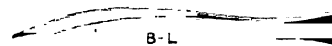
	No.	G	H	I	
Capacity, cc	201	4	400	500	e
Each	.75	1.15	1.30		



- |        |   |    |     |
|--------|---|----|-----|
| C-3130 | Flasks—Sugar—Bates' - Pear-shaped, with flaring top, capacity, 100 cc | .. | .55 |
|--------|---|----|-----|

- C-3135 Flasks—Sugar—**With two graduations, without glass stopper.

	No. A	B	C
Capacity, cc	50 and 55	100 and 110	200 and 220
Each	.34	.42	.60



- |         |                             |         |     |
|---------|-----------------------------|---------|-----|
|         |                             | C-13238 |     |
| C-13230 | Forceps- Of brass; straight |         |     |
|         | Each . . . . .              |         | .35 |

- |         |  |     |
|---------|--|-----|
| C-13232 | Forceps--Same as No C-13230, but nickel-plated |     |
|         | Each .....                                     | .35 |

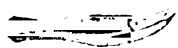
- |         |                         |     |
|---------|-------------------------|-----|
| C-13238 | Forceps--Of brass; bent |     |
|         | Each .....              | .35 |

- |                |  |     |
|----------------|--|-----|
| <b>C-13240</b> | <b>Forceps</b> —Same as No C-13238, but nicked-plated. |     |
|                | Each .....   | .35 |

*Continued on Next Page*



C-13255



C-13245

**C-13245 Forceps**—Of brass, with ivory tips.  
Each

1.00

**C-13255 Forceps**—Of steel, plain

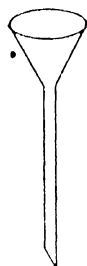
	No.	A	B	C	D
Length, mm	75	100	125	150	
Each	13	13	15	17	

**C-13260 Forceps—Platinum-Tipped**—Nickel plated with heavy platinum shoes. Length 170 mm.  
Price on application

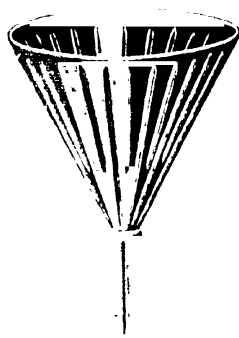
## FUNNELS •

**C-3140 Funnels**—Of clear, white glass, with stem ground to point, angle 60°

	No.	A	B	C	D	F	F
Diameter, mm	25	50	40	65	65	75	
Each	20	20	20	23	24	27	
	No.	G	H	I	J	K	
Diameter, mm	90	100	110	120	150		
Each	29	32	38	44	55		
	No.	L	M	N	O	P	
Diameter, mm	170	200	225	250	300		
Each	75	85	135	170	325		



C-3145



C-3155



C-3150

**C-3145 Funnels—Bunsen's**—Of clear, white glass, having an exact angle of 60°, with long thin stems ground to point, for use with rubber stopper in filtering flask, with ground rim

	No.	A	B	C	D	E
Diameter, mm	25	40	50	65	75	
Each	20	20	23	24	27	
	No.	F	G	H	I	J
Diameter, mm	90	100	110	120	150	
Each	29	32	38	44	55	

**C-3150 Funnels—Bunsen's**—Of clear, white glass, with construction in top of stem, facilitating rapid filtration, with stem ground to point, angle, 60°

	No.	A	B	C	D
Diameter, mm	50	65	75	100	
Each	25	27	30	35	

**C-3155 Funnels**—Of clear, white glass, ribbed, designed for rapid filtration, with stem ground to point, angle, 60°

	No.	A	B	C	D	E
Diameter, mm	65	70	90	120	150	
Capacity, cc	25	50	125	250	500	
Each	18	19	20	30	45	
	No.	F	G	H	I	
Diameter, mm	180	220	255	325		
Capacity, cc	1000	2000	4000	8000		
Each	62	100	155	335		

Prices subject to change without notice



C-5795 5800



C-5805

**C-5795—Funnels—Buchner**—Coors porcelain, with fixed perforated plate and straight walls

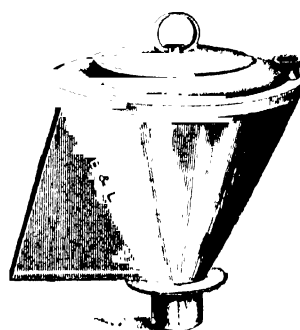
	No.	0	1	2	2a
Diameter, mm	48	66	82	102	
Height, mm	76	100	130	165	
Distance plate from rim, mm	17	2	3	46	
Each	Net	90	108	180	234
	No.	3	4	4a	5
Diameter, mm	122	138	163	200	
Height, mm	195	215	234	280	
Distance plate from rim, mm	2	61	66	75	
Each	Net	252	432	504	648

**C-5800 Funnels—Buchner**—Ohio porcelain, with fixed perforated plate and straight walls

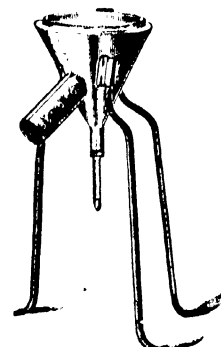
	No.	1	2	3	4
Diameter, mm	40	60	80	100	
Height of walls, mm	70	75	80	40	
Each	65	85	110	150	
	No.	5	6	7	8
Diameter, mm	130	200	250	300	
Height of walls, mm	60	90	100	120	
Each	240	470	725	1200	

**C-5805 Funnels—Hirsch**—Coors porcelain, with fixed perforated plate

	No.	000	00	0	1
Diameter, mm	40	75	92	103	
Height, mm	61	95	121	131	
Diameter perforated plate, mm	28	28	28	28	
Distance plate from rim, mm	12	18	33	41	
Each	Net	72	90	108	144
	No.	2	3	4	
Diameter, mm	120	140	163		
Height, mm	158	185	217		
Diameter perforated plate, mm	45	45	60		
Distance plate from rim, mm	45	62	69		
Each	Net	180	252	324	



C-13303 07



C-13311

**C-13303 Funnel—Hot Water**—According to Plantamour, double-walled, of copper

Each 7.00

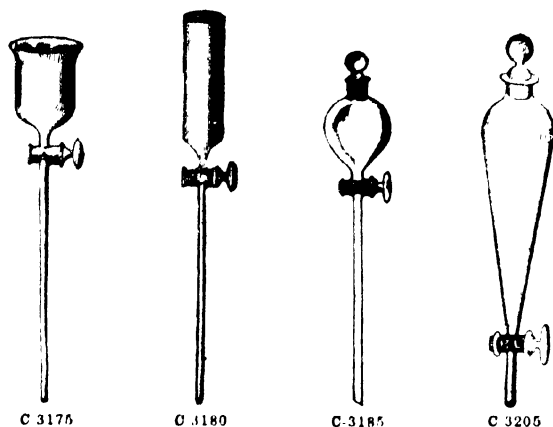
**C-13307 Funnel—Hot—Water**—According to Plantamour, double-walled, of tin

Each 5.00

**C-13311 Funnel—Hot Water**—Of heavy, polished copper, double-walled; mounted on three iron legs

Each 6.75

Continued on Next Page

**C-3175 Funnels—Separatory**—Open top, bell shape

	No.	A	B	C	D
Capacity, cc		25	50	75	100
Each		.72	.90	1.00	1.15

**C-2180 Funnels—Separatory**—Open top, cylindrical

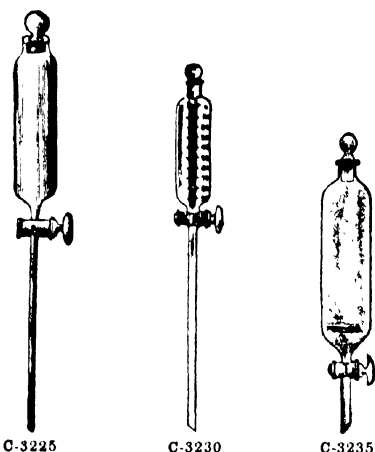
	No.	A	B	C	D
Capacity, cc		30	60	100	125
Each		.75	.87	1.05	1.15
	No.	E	F	G	
Capacity, cc		150	200	250	
Each		1.20	1.25	1.35	

**C-3185 Funnels—Separatory**—With ground, glass stopper; pear shape

	No.	A	B	C	E
Capacity, cc		30	60	125	250
Each		.87	.93	1.15	1.40
	No.	G	H	I	J
Capacity, cc		500	750	1000	2000
Each		1.70	1.95	2.40	3.90

**C-3205 Funnels—Separatory—Squibb's** With ground, glass stopper

	No.	A	B	C	D	E
Capacity, cc		125	250	500	1000	2000
Each		1.05	1.55	1.95	2.95	4.70

**C-3225 Funnels—Separatory**—With ground, glass stopper; cylindrical; ungraduated

	No.	B	C	D	E
Capacity, cc		60	125	250	300
Each		.93	1.15	1.50	1.70
	No.	F	G	H	
Capacity, cc		500	1000	1250	
Each		1.80	2.40	2.85	

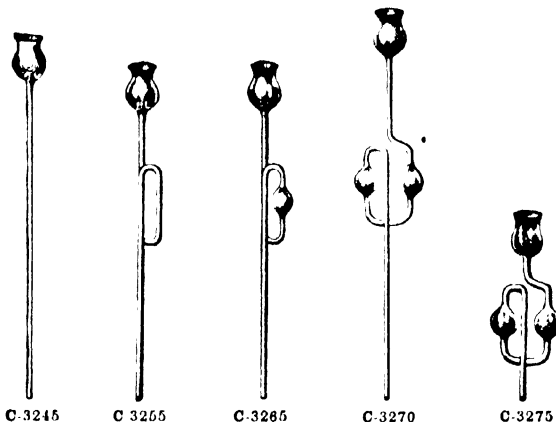
Prices subject to change without notice

**C-3230 Funnels—Separatory**—With ground, glass stopper; cylindrical, graduated

	No.	A	B	C	D
Capacity, cc		125	250	500	1000
Each		1.85	2.85	3.50	4.70

**C-3235 Funnels—Separatory**—Of stout glass, with ground, glass stopper and short stem, cylindrical

	No.	A	B
Capacity, cc		500	1000
Each		2.25	2.95

**C-3245 Funnel Tubes**—Straight, thistle top

	No.	A	B	C	D
Length, mm		200	250	300	400
Each		.09	.10	.10	.11

**C-3255 Funnel Tubes**—With loop, thistle top

	No.	A	B	C
Length, mm		200	300	400
Each		.22	.22	.27

**C-3265 Funnel Tube**—With loop and one bulb, thistle top; length, 300 mm

Each	.28
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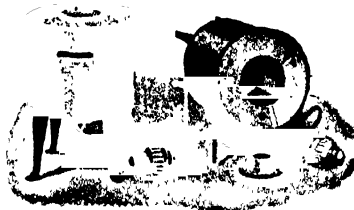
All of above funnel tubes can be supplied with conical tops if desired

**C-3270 Funnel Tube**—With double loop and two bulbs; thistle top; length, 300 mm

Each	.35
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**C-3275 Funnel Tube**—With double loop and two bulbs near top, thistle top; with short stem, length, 300 mm

Each	.37
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**C-390****C-390 Furnace—Crucible and Muffle Combined**—Chamber 2 in diameter by 2½ in deep, can be heated to 1000°C in approximately thirty minutes. Furnace can be used in upright position or on special wire stand in horizontal position. Complete with connecting cord and plug.

Each	Net 28.00
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(Please state voltage and current when ordering.)

**C-391 Furnace, Crucible and Muffle Combined**—Same as No C-390, but with rheostat.

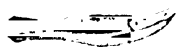
Each	Net 40.00
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Gas and oil heated furnaces can also be supplied. Send us your specifications.

Continued on Next Page



C-13255



C-13245

**C-13245 Forceps**—Of brass, with ivory tips.  
Each

1.00

**C-13255 Forceps**—Of steel, plain

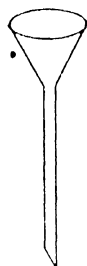
	No.	A	B	C	D
Length, mm	75	100	125	150	
Each	13	13	15	17	

**C-13260 Forceps—Platinum-Tipped**—Nickel plated with heavy platinum shoes. Length 170 mm.  
Price on application

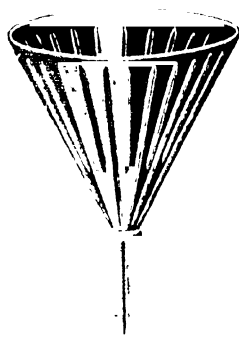
## FUNNELS •

**C-3140 Funnels**—Of clear, white glass, with stem ground to point, angle 60°

	No.	A	B	C	D	F	F
Diameter, mm	25	50	40	65	65	75	
Each	20	20	20	23	24	27	
	No.	G	H	I	J	K	
Diameter, mm	90	100	110	120	150		
Each	29	32	38	44	55		
	No.	L	M	N	O	P	
Diameter, mm	170	200	225	250	300		
Each	75	85	135	170	325		



C-3145



C-3155



C-3150

**C-3145 Funnels—Bunsen's**—Of clear, white glass, having an exact angle of 60°, with long thin stems ground to point, for use with rubber stopper in filtering flask, with ground rim

	No.	A	B	C	D	E
Diameter, mm	25	40	50	65	75	
Each	20	20	23	24	27	
	No.	F	G	H	I	J
Diameter, mm	90	100	110	120	150	
Each	29	32	38	44	55	

**C-3150 Funnels—Bunsen's**—Of clear, white glass, with construction in top of stem, facilitating rapid filtration, with stem ground to point, angle, 60°

	No.	A	B	C	D
Diameter, mm	50	65	75	100	
Each	25	27	30	35	

**C-3155 Funnels**—Of clear, white glass, ribbed, designed for rapid filtration, with stem ground to point, angle, 60°

	No.	A	B	C	D	E
Diameter, mm	65	70	90	120	150	
Capacity, cc	25	50	125	250	500	
Each	18	19	20	30	45	
	No.	F	G	H	I	
Diameter, mm	180	220	255	325		
Capacity, cc	1000	2000	4000	8000		
Each	62	100	155	335		

Prices subject to change without notice



C-5795 5800



C-5805

**C-5795—Funnels—Buchner**—Coors porcelain, with fixed perforated plate and straight walls

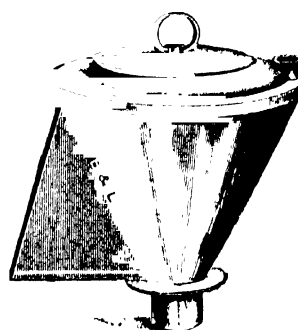
	No.	0	1	2	2a
Diameter, mm	48	66	82	102	
Height, mm	76	100	130	165	
Distance plate from rim, mm	17	2	3	46	
Each	Net	90	1.08	1.80	2.34
	No.	3	4	4a	5
Diameter, mm	122	138	163	200	
Height, mm	195	215	234	280	
Distance plate from rim, mm	2	61	66	75	
Each	Net	2.52	4.32	5.04	6.48

**C-5800 Funnels—Buchner**—Coors porcelain, with fixed perforated plate and straight walls

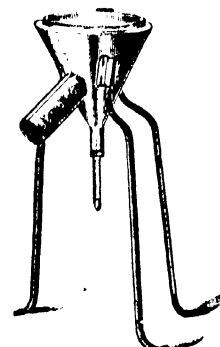
	No.	1	2	3	4
Diameter, mm	50	60	80	100	
Height of walls, mm	70	75	80	40	
Each	65	85	110	150	
	No.	5	6	7	8
Diameter, mm	150	200	250	300	
Height of walls, mm	60	90	100	120	
Each	2.40	4.70	7.25	12.00	

**C-5805 Funnels—Hirsch**—Coors porcelain, with fixed perforated plate

	No.	000	00	0	1
Diameter, mm	50	75	92	103	
Height, mm	61	95	121	131	
Diameter perforated plate, mm	28	28	28	28	
Distance plate from rim, mm	12	18	33	41	
Each	Net	72	90	1.08	1.44
	No.	2	3	4	
Diameter, mm	120	140	163		
Height, mm	158	185	217		
Diameter perforated plate, mm	45	45	60		
Distance plate from rim, mm	45	62	69		
Each	Net	1.80	2.52	3.24	



C-13303 07



C-13311

**C-13303 Funnel—Hot Water**—According to Plantamour, double-walled, of copper

Each 7.00

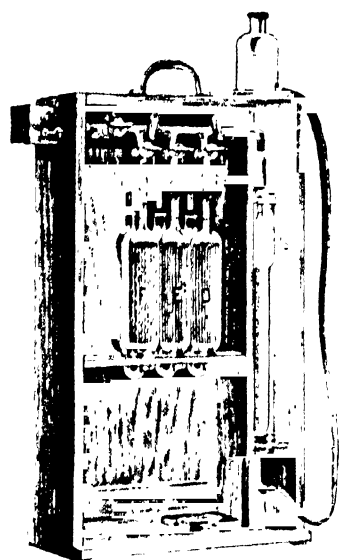
**C-13307 Funnel—Hot—Water**—According to Plantamour, double-walled, of tin

Each 5.00

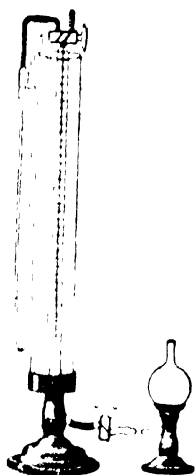
**C-13311 Funnel—Hot Water**—Of heavy, polished copper, double-walled; mounted on three iron legs

Each 6.75

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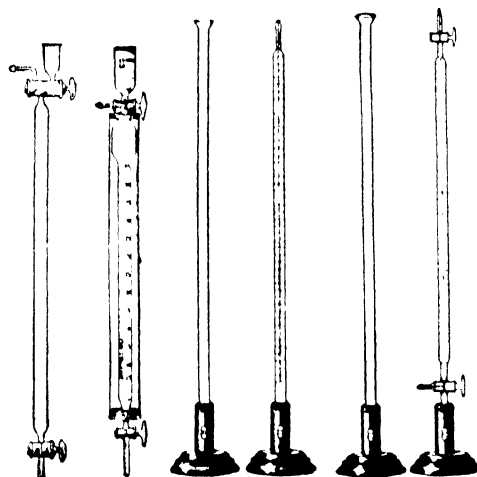


C-3575 SEE PAGE 1021



C-3560

**C-3560 Gas Burette—Hempel's** With correction for temperature and pressure, for measurement of gas volumes between 0.5 and 100 cc., with stopcock and leveling bulb.  
Each . . . . . 16.50



C-3540

C-3545

C-3550

C-3570

**C-3540 Gas Burette—Bunte's** Without water jacket, graduated to 50 cc. in 1-10 cc. steps, with two stopcocks.  
Each . . . . . 3.40

**C-3545 Gas Burette—Bunte's** Same as No. C-3540 above, but with water jacket, fitted with rubber stopper.  
Each . . . . . 4.20

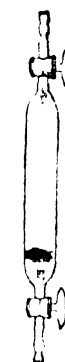
**C-3550 Gas Burette—Hempel's** Consists of one tube graduated to 100 cc. in 1-5 cc. steps and one plain tube, mounted on weighted, wooden bases.  
Per set . . . . . 4.50

**C-3570 Gas Burette—Hempel-Winkler's** Same as No. C-3550 above, but with graduated tube fitted with glass stopcocks, as illustrated.  
Per set . . . . . 6.00

Prices subject to change without notice



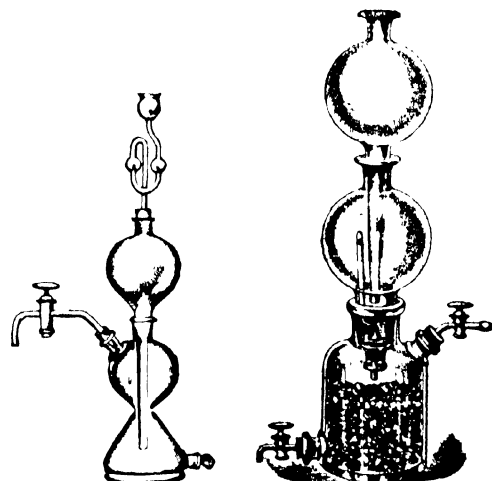
C-3595



C-3600

**C-3595 Gas Collecting Tube—U. S. Bureau of Mines Form**  
— With two stopcocks and sealed in tube.  
Each . . . . . 4.00

**C-3600 Gas Collecting Tube—Thoerner's** Long form, with two stopcocks, capacity, about 125 cc.  
Each . . . . . 2.25



C-3640

C-3647

**C-3640 Gas Generator—Kipp's** Improved form, for the continued generation of hydrogen sulfide, with large side opening for filling, complete with Geissler's stopcock, funnel tube, etc.

No.	A	B	C	D	E
Generator size, cc.	250	500	1000	1500	2000
Each	6.80	7.50	11.00	12.50	14.50

**C-3645 Perforated Rubber Plates** For holding the iron sulfide in the above generator, No. C-3640, from falling into the lower chamber.

No.	A	B	C	D	E
Generator size, cc.	250	500	1000	1500	2000
Each	.20	.25	.30	.35	.40

**C-3647 Gas Generator—McCoy's** For continuous generation of gases. Very easily cleaned.

No.	A	B	C	D
Capacity, cc.	500	1000	1500	2000
Each	7.50	11.00	12.50	14.50

**C-3675 Gas Leveling Bulb** For use in gas analysis and other purposes, mounted on iron stand.  
Each . . . . . 2.20

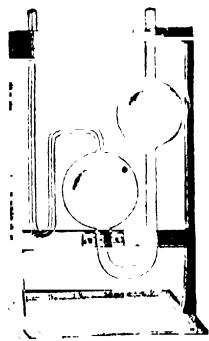
**C-3680 Glass Bulb only.**  
Each . . . . . .90



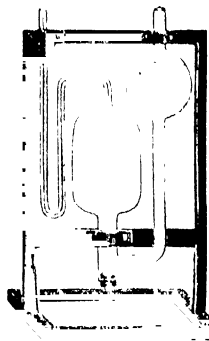
C-3675

Continued on Next Page

**Gas Pipettes—Hempel's** Mounted on latest improved iron supports, the glass parts being fastened to the stands by means of adjustable metallic clamps with cork inserts instead of being cemented to wooden or metal frames with plaster of paris, as in older forms. In this form of stand it is possible to attach new glass parts very quickly, the adjustable clamps compensating for any slight variation in the shape or dimensions of the pipette.

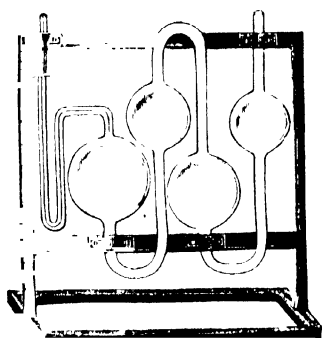


C-3700



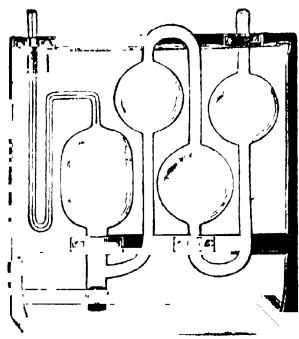
C-3705

C-3700	Gas Pipette—Hempel's	Simple absorption, for liquid reagents	Each	4.00
	Glass Parts only		Per set	2.00
C-3705	Gas Pipette—Hempel's	Simple absorption, for liquid and solid reagents	Each	4.25
	Glass Parts only		Per set	2.25



C-3710

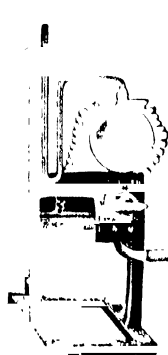
C-3710	Gas Pipette—Hempel's	Double absorption, for liquid reagents	Each	5.00
	Glass Parts only		Per set	2.75



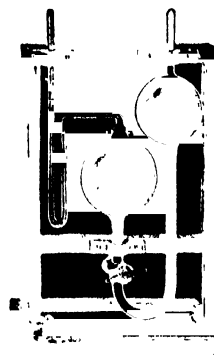
C-3715

C-3715	Gas Pipette—Hempel's	Double absorption, for solid and liquid reagents	Each	5.25
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	Glass Parts only		Per set	3.00
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C-3730



C-3735

C-3730	Gas Pipette—Hempel's	Simple explosion, with platinum electrodes, stopcock and leveling bulb	Each	9.00
	Glass Parts only		Per set	5.00
C-3735	Gas Pipette—Hempel's	Simple explosion, with platinum electrodes and stopcock	Each	7.00
	Glass Parts only		Per set	5.00



C-3750



C-3760



C-3765

C-3750	Gas Washing Bottle—Allihn's	Double acting, with ground in stopper	No.	A	B	C
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Capacity, cc	250	500	1000
Each	2.50	3.00	3.80

C-3760	Gas Washing Bottles—Drechsel's	High form			
	No.	A	B	C	D
Capacity, cc	100	150	250	500	
Each	.85	.95	1.25	1.50	

C-3765	Gas Washing Bottles--Drechsel's	Low form			
	No.	A	B	C	D
Capacity, cc	100	150	250	500	
Each	.85	.95	1.25	1.50	

C-13345	Gas—Carbon Dioxide	In 20 lb. cylinders	Per lb.	.40
	Cylinders extra and returnable prepaid	Each	Net	18.00

C-11385	Gas—Sulfur Dioxide	In 8 10 lb. cylinders including cylinders	Each	Net	27.00
		Cylinder's refillable, but not returnable for credit.	Each	Net	10.00

Prices subject to change without notice

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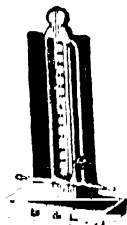
- C-13380 Gas—Oxygen**—In 40 gal cylinders filled  
Cylinders returnable prepaid Net 12.00  
Each . . . . . Net 8.00

- C-20225 Gas—Hydrogen**—In cylinders of 160 cu ft capacity  
at 2000 pounds pressure, without cylinders  
Each . . . . . Net 10.00  
Gas—Hydrogen—As above including cylinders  
Each . . . . . Net 40.00  
Cylinders returnable prepaid for credit  
Each . . . . . Net 30.00

A rental charge of 25 c per week will be  
made against each cylinder not returned to us  
or to the nearest International Oxygen Co. sta-  
tion within a month of date of shipment



C-3795



C-3800

- C-3795 Gauge—Vacuum (Manometer)**—Consists of glass  
U-tube on wooden support, with scale, without  
mercury.  
Each . . . . . 2.50

- C-3800 Gauge—Vacuum (Manometer)—Bennett's**—With  
glass stopcock and movable scale engraved on  
wood; without mercury  
Each . . . . . 12.00

- C-3810 Glass Beads**—Used to create a large surface for  
absorption of gases, or to prevent bumping, with  
hole through center, length, 5 to 6 mm., diame-  
ter, 3 to 8 mm  
Per lb. . . . . 2.00

- C-3811 Glass Beads—Solid; diameter 4 to 5 mm**  
Per lb. . . . . 2.50



## GLASS TUBING

- C-3815 Glass Tubing**—Of best quality, soft glass, medium  
wall thickness; in 5-foot lengths (If full  
lengths are desired, such must be specified;  
otherwise shorter lengths, more convenient for  
packing, will be supplied)

	No. A	B	C	D
Diameter, outside, mm . . . . .	1 1/2-2 1/2	2 1/2-3 1/2	3 1/2-4	5-6
Per lb. . . . .	1.20	1.00	.70	.50

	No. E	F	G	H
Diameter, outside, mm . . . . .	7-8	8-10	10-11	12-14
Per lb. . . . .	.45	.40	.35	.32

	No. I	J	K	N
Diameter, outside, mm . . . . .	15-21	22-25	26-30	31-35
Per lb. . . . .	.28	.32	.26	.28

	No. O	P
Diameter, outside, mm . . . . .	36-44	45-51
Per lb. . . . .	.35	.42

- C-3820 Glass Tubing—Pyrex—Standard Wall**—Of same  
composition as Pyrex chemical ware; recom-  
mended where sudden changes of temperature  
and mechanical strength are necessary; sup-  
plied in 3-foot lengths.

Prices subject to change without notice

	No. A	B	B-1
Approx diam, outside, mm . . . . .	4.76	6.35-9.13	9.52-12.3, incl.
Approx wall thickness, mm . . . . .	.08	1.0	.12

Per lb. . . . . Net	1.00	.90	.80
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	No. C	D	E
Approx diam, outside, mm . . . . .	12.7-21.8	22.2-31.4	31.8-37.7, incl.
Approx wall thickness, mm . . . . .	1.6	2.0	2.4

Per lb. . . . . Net	.90	.96	1.10
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	No. F	G	I
Approx diam, outside, mm . . . . .	38.1-50.4	50.8-63.1	63.5-69.5, incl.
Approx wall thickness, mm . . . . .	2.4	2.4	2.4

Per lb. . . . . Net	1.36	1.66	2.00
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- C-3825 Glass Tubing—Barometer**—In sizes from 5 to 15 mm  
outside diameter  
Per lb. . . . . .60

- C-3830 Glass Tubing—Capillary**—Outside diameter, from 5  
to 7 mm

	No. A	B	C	D
Diameter of bore, mm . . . . .	1/4	1/2	3/4	1
Per lb. . . . .	.60	.60	.60	.60

- C-3835 Glass Rod**—Of best soft glass, easily melted; diam-  
eters ranging, as indicated below.

	No. A	B	C	D	E
Diameter, mm . . . . .	2-3	3	4-5	6-7	8-13
Per lb. . . . .	.60	.45	.35	.30	.28

- C-3840 Glass Stirring Rods**—With ends properly rounded

	No. B	C	D	E	F
Length, mm. . . . .	125	150	200	250	300
Diameter, mm. . . . .	5	6	6	6	8
Per dozen. . . . .	.30	.35	.42	.55	.90



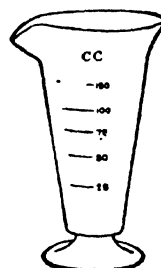
C-13445

- C-13460 Glass Cutters**—Steel wheel; for glass plates.  
Each . . . . . .20

- C-13445 Glass Cutter for Tubing—Griffin's**—Of brass,  
nickel-plated, fitted with spring, keeping it open  
and ready for use.  
Each . . . . . 1.30

## Extra Cutting Wheels.

- Each . . . . . .15



C-3845

- C-3845 Graduates—Glass—Conical;** of  
ordinary accuracy; graduated in  
cubic centimeters

	No. D	E	G	I
Capacity, cc . . . . .	30	60	125	250
Each . . . . .	.35	.50	.58	.78

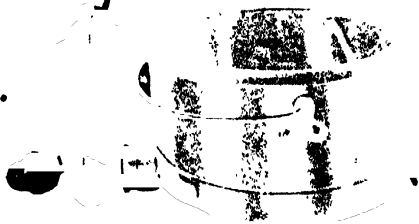
	No. J	K	L
Capacity, cc . . . . .	375	500	1000
Each . . . . .	1.00	1.20	2.15

- C-3850 Graduates—Glass—Conical;**  
graduated in ounces.

	No. E	G	H	I	K	L
Capacity, oz. . . . .	2	4	6	8	16	32
Each . . . . .	.42	.52	.57	.62	1.05	1.80

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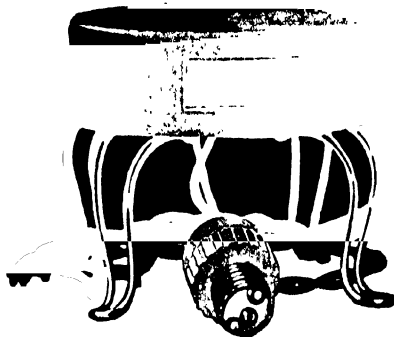




C-13479

- C-13479 Heater—Electric Glue Pot**—A new aluminum heater of jacketed, one piece construction with bail handle that can be used to advantage for many laboratory operations. Heat distribution very uniform and a temp of about 170°F obtained in about 30 minutes. Supplied with heater cord and separable attachment plug

	No.	A	B	C	D
Capacity, qts.	1	2	4	8	
Each		22.00	24.00	28.00	32.00



C-13485

- C-13485 Hot Plate—Electric, Hoskins'**—Circular, of 6-in diameter, has pressed steel top and heavy bent wire legs; spiral resistance unit and uniform heat distribution, draws 500 watts and requires use of 5-ampere snap or knife switch, maximum temperature, 483°C (900°F), boils one liter from cold temperature in 15 minutes, furnished with 6-ft, twin-conductor, flexible cord and detachable connector plugs

Each .....Net 8.00

- C-13486 Extra Heating Unit.**  
Each .....Net 4.00  
(Please state current and voltage when ordering.)



C-13490

- C-13490 Hot Plate—Electric, Hoskins'**—Square, 12 x 12 in.; has sheet steel top and cast-iron legs; centrally heated by spiral resistance unit, covering circular area of 5 3/4-in diameter; draws 500 watts and requires 5-ampere snap or knife switch; maximum temperature in center, 260°C (500°F); at edge, 121°C (250°F); boils one liter of water from cold temperature in 15 minutes; furnished with 6-ft, twin-conductor, flexible cord and detachable connector plugs.

Each .....Net 12.00

- C-13491 Extra Heating Unit.**  
Each .....Net 4.00  
(Please state current and voltage when ordering.)

Prices subject to change without notice



C-13495

- C-13495 Hot Plates—Electric, Hoskins'**—Oblong, with three heats, has steel top and legs, heated by renewable resistance unit, composed of three parallel windings, each controlled by a snap switch on front of plate, gives uniform heat distribution; "low" heat, 246°C (475°F) obtained with switch "1", "medium" heat, 316°C (600°F) with switches "1" and "2", and "high" heat, 399°C (750°F) with switches "1," "2" and "3"; high heat boils one liter of water from cold temperature in 20 minutes, requires use of double-pole knife switch of proper capacity; furnished with 6 ft, twin-conductor, flexible cord and detachable connector plug

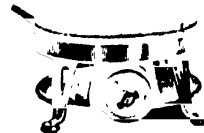
	No.	AA	A	B	C
Size, in		12 x 12	12 x 18	18 x 24	18 x 36
Each	Net	40.00	57.50	87.50	110.00

- C-13497 Extra Heating Unit** For sizes A, B and C  
Each .....Net 14.50

- C-13498 Extra Heating Unit** For size "AA"  
Each .....Net 12.00  
(Please state current and voltage when ordering.)



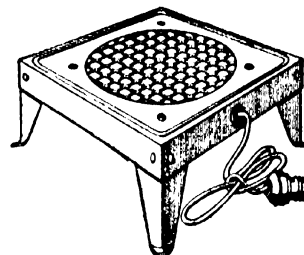
C-13525



C-13530

- C-13525 Hot Plate—Electric**—Of nickel-plated steel; single heat, diameter, 115 mm, height, 75 mm, heating element guaranteed for two years  
Each .....Net 7.25  
(Please state current and voltage when ordering.)

- C-13530 Hot Plate — Electric**—Of nickel-plated steel; equipped with three heat snap switch, heating element guaranteed for two years, diameter, 150 mm; height, 100 mm  
Each .....Net 10.00  
(Please state current and voltage when ordering.)



C-13531-32

- C-13531 Hot Plate**—An electric stove of durable construction and high efficiency. Heating coils below grid permit of rapid boiling. One heat, furnished in black japan with cord and plug for 110 volt A.C. and D.C. only.  
Each .....Net 5.00

- C-13532 Hot Plate**—Same as No. C-13531 above, but with nickel finish.  
Each .....Net 6.00

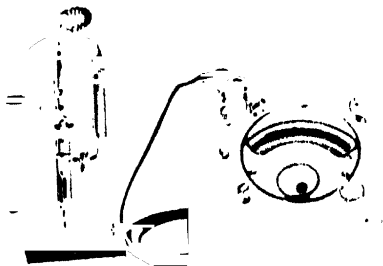
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C-14546

**C-14546 Hot Plate Burner** Gas heated, with polished steel top, extra heavy

No.	A	B	C	D	E	F
Length, mm	300	400	600	765	915	1220
Width, mm	180	240	360	460	540	760
Each	9.75	19.50	28.00	36.50	44.00	71.50



C-20105

#### Hydrogen-ion Equipment—Elliott "Ion-O-Meter"

This apparatus was developed to fill the pressing need of an equipment that would be simple in operation, of rugged construction, and maintain a high degree of accuracy necessary for the application of the electrometric method to plant and research problems. It can be used for the rapid and accurate determination of the concentration of hydrogen and other ions in solutions or industrial liquids without employing the complicated set-ups and technique formerly used.

Besides a simplicity which assures its successful use by semi-skilled operators the "Ion-O-Meter" is characterized by a rapidity of operation unequalled by any other equipment on the market. A complete determination of the strength of a sample of any of the acids ordinarily met with in the laboratory or in the plant may be made within 15 minutes. It has been used extensively and with complete success in many biological problems. Its portability recommends it for field work in the determination of soil acidities.

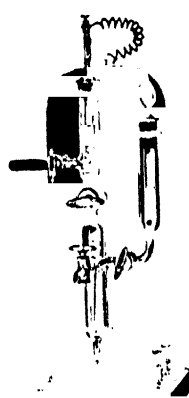
The "Ion-O-Meter" is at present supplied in two models known as the single cell "Ion-O-Meter" and the double cell "Ion-O-Meter". The single cell type uses a saturated KCl-calomel electrode as the standard of comparison. It is novel in that it has but one contact layer and inasmuch as that junction is between the unknown solution and saturated KCl all so-called contact potential is eliminated.

The double cell uses a standard hydrogen electrode for reference which is connected to the unknown cell by a bridge of saturated KCl solution. This eliminates all contact potential as well as serving as an excellent conductor of the F. M. F. set up at the electrodes. The hydrogen electrodes of both types are made of platinum gauze of very liberal size and coated by our special method with amorphous palladium. This process ensures a rapid saturation with the hydrogen gas as well as the ability to stay saturated. The saturation is effected by spraying the hydrogen through aluminum cones which reduces the size of the bubbles to such an extent that five or ten minutes is ample for complete saturation.

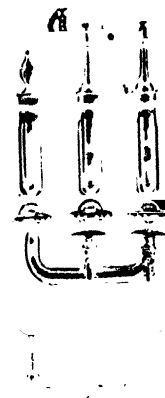
Prices subject to change without notice

"Ion-O-Meter" Cells are never supplied unmounted. The "Ion-O-Meter" Pyrovolter was especially designed for use with the instrument. On account of its low resistance it is far preferable to purchase and employ the complete equipment wherever possible. However, these cells will function perfectly with any refined type of Potentiometer, and are accordingly listed below both with and without Pyrovolter.

- C-20105 Ion-O-Meter, Saturated Calomel Single Contact**  
Consisting of a single cell mounted on substantial wooden base, fitted with leads, and with binding posts for connecting Pyrovolter, connector for coil to hydrogen tank, sensitized platinum electrode, calomel cell, hydrogen diffusion thimble and Pyrovolter. Each . . . 190.00



C-20110



C-20160

- C-20110 Ion-O-Meter Cells, Single Contact** Mounted on substantial wooden base with binding posts, single sensitized platinum electrode, fitted with hydrogen diffusion thimbles and connector for coil to hydrogen tank, but without Pyrovolter. Each . . . 55.00
- C-20115 Wooden Carrying Case** For saturated calomel single contact cell. Each . . . 15.00
- C-20155 Ion-O-Meter, Double Contact, Double Hydrogen Electrode** Consisting of a double cell with binding posts for connecting leads from Pyrovolter, connector for coil to hydrogen tank, 2 sensitized platinum electrodes, 2 hydrogen diffusion thimbles, all mounted on substantial wooden base with Pyrovolter. Ready for operation. Each . . . 205.00
- C-20160 Ion-O-Meter Cells, Double Contact** Mounted on substantial wooden base, 2 sensitized platinum electrodes, fitted with hydrogen diffusion thimbles and connector for coil to hydrogen tank, but without Pyrovolter. Each . . . 70.00
- C-20165 Wooden Carrying Case** For double contact, double hydrogen cell. Each . . . 18.00

#### Price List Accessories

- C-20175 Tipped Double Electric Leads for Pyrovolter**, 6 ft long. Per set of two . . . 2.00
- C-20185 Platinum Electrodes** coiled gauze for either single or double cells. Each . . . 7.50
- C-20195 Platinum Electrodes** coiled gauze, sensitized, for either single or double cells. Each . . . 10.00
- C-20205 Platinum Electrodes**, charge for re-sensitizing. Each . . . 2.50
- C-20225 Hydrogen** in cylinders of 100 cu. ft. capacity at 2,000 lb. per sq. in. pressure, complete with valve and protecting cap. Each . . . 40.00

Note—Cylinders must be returned to International Oxygen Co. works, as quickly as they become empty, prepaid, before 30 days from date of shipment has elapsed. A rental charge of 25c per week will be made against each cylinder that is not returned prepaid to the International Oxygen Co. within one month from date of shipment.

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C-20245	Hydrogen in portable cylinders for field tests, 12" long, 4" diam. not returnable. Each	10.00
		Note: Small cylinders if returned to Will Corporation, charges prepaid, will be refilled.
	Refilling portable cylinders, each	2.00
C-20275	Pressure Reducing Valve and regulator for delivering hydrogen at low pressure to the Ion-O-Meter, equipped with 2 1/2" U. S. 3000 lb. gauge and 2 1/2" U. S. 30 lb. gauge fitted with 1/2" left hand thread connection for International Oxygen Company's hydrogen tanks with 2" diaphragm controller. Each	22.50
C-20295	Heavy walled pure gum rubber tubing for connecting hydrogen tanks with Ion-O-Meter. Per foot	22
C-20315	Pincocks, heavy, for Ion-O-Meter hydrogen cells. Each	30
C-20325	Gas Distributors for connecting up a number of Ion-O-Meter cells with a single hydrogen tank, each lead from distributor individually controlled by pet. cocks, for direct connection to pressure regulator. 20275. Two-lead distributor. Each	3.00
C-20350	2-lead distributor with 6 ft. copper hydrogen tubes. Each	7.00
C-20360	4-lead distributor with four 6 ft. copper hydrogen tubes. Each	11.00
C-20370	6-lead distributor with six 6 ft. copper hydrogen tubes. Each	15.00
C-20395	Copper hydrogen tubes for connecting multiple gas distributor, 6 ft. lengths. Each	2.00
C-20415	Stopcock grease. Per tube	50

**Accessory Chemicals**

41 M. KCl solution. Per liter	1.50
41 M. KCl solution saturated with calomel. Per liter	2.25
41 M. KCl solution containing diffusion indicator. Per liter	1.75
41 M. KCl solution saturated with calomel containing diffusion indicator. Per liter	2.50
Calomel paste, purified, for use with single contact Ion-O-Meter 4 cc. ampoules. Each	50
Purified mercury for single contact Ion-O-Meter, 1 cc. ampoules. Each	25
Diffusion indicator, dry. Per 10 gm.	95
KCl purified for Hydrogen-ion work, dry. Per 100 g.	50
KCl purified for Hydrogen-ion work with diffusion indicator, dry. Per 100 g.	65
Standard Hydrochloric acid, Ph. 0.1. Per liter	1.50

**HYDROMETERS**

C-3985 Hydrometers—Baumé—For liquids lighter than water, standard quality, about 11 to 12 in. long

No.	D	E	F	G	H
Scale	30-10°	40-20°	50-30°	60-40°	70-50°
Divisions	1/4°	1/4°	1/4°	1/4°	1/4°
Each	1.50	1.50	1.50	1.50	1.50
No.	I	J	K	L	M
Scale	80-60°	90-70°	100-80°	50-10°	30-10°
Divisions	1/4°	1/4°	1/4°	1/10°	1/10°
Each	1.50	1.50	1.50	1.75	1.75
No.	N	O	P	Q	R
Scale	21-10°	31-19°	41-29°	51-39°	61-49°
Divisions	1/10°	1/10°	1/10°	1/10°	1/10°
Each	1.75	1.75	1.75	1.75	1.75
No.	S	T	U		
Scale	71-59°	81-69°	91-79°		
Divisions	1/10°	1/10°	1/10°		
Each	1.75	1.75	1.75		

C-4005 Hydrometers—Baumé—For liquids heavier than water, standard quality, length about 14 in.

No.	H	I	J	K	L
Scale	0-25°	25-50°	50-70°	0-11°	5-15°
Divisions	1/4°	1/4°	1/4°	1/10°	1/10°
Each	1.50	1.50	1.50	1.75	1.75

Prices subject to change without notice

No.	M	N	O	P	Q
Scale	0-21°	19-31°	29-41°	39-50°	39-51°
Divisions	1/10°	1/10°	1/10°	1/10°	1/10°
Each	1.75	1.75	1.75	1.75	1.75

No.	R	S	T
Scale	49-61°	0-70°	89-71°
Divisions	1/10°	1/10°	1/10°
Each	1.75	1.75	1.75

C-4182 Hydrometer—Baumé and Specific Gravity Scales—For light liquids, standard quality, length about 12 inches

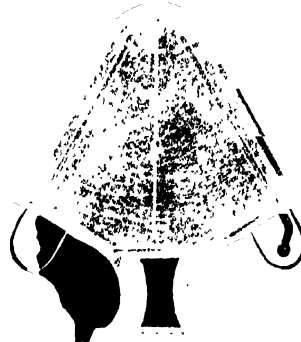
No.	A	B	C
Sp. Gr. scale, degrees	0.700-1.000	0.700-0.850	0.850-1.000
Bé. scale, degrees	70-10	70-34	34-10
Each	2.00	2.00	2.00
No.	D	E	F
Sp. Gr. scale, degrees	0.700-0.800	0.800-0.900	0.900-1.000
Bé. scale, degrees	70-44	44-25	25-10
Each	2.00	2.00	2.00

C-4172 Hydrometer—Baumé and Specific Gravity Scales—For light liquids, standard quality, length about 6 inches

No.	A	B	C
Sp. Gr. scale, degrees	0.700-1.000	0.700-0.800	0.800-0.900
Bé. scale, degrees	70-10	70-44	44-25
Each	1.50	1.50	1.50
No.	D		
Sp. Gr. scale, degrees	0.900-1.000		
Bé. scale, degrees	25-10		
Each	1.50		

C-4217 Hydrometer—Baumé and Specific Gravity Scales—For heavy liquids, ordinary quality, length about 12 inch

No.	A	B	C
Sp. Gr. scale, degrees	1.000-2.000	1.000-1.400	1.400-2.000
Bé. scale, degrees	0-70	0-41	41-70
Each	1.60	1.60	1.60
No.	D	E	F
Sp. Gr. scale, degrees	1.000-1.200	1.200-1.400	1.400-1.600
Bé. scale, degrees	0-24	24-41	41-54
Each	1.60	1.60	1.60
No.	G	H	
Sp. Gr. scale, degrees	1.600-1.800	1.800-2.000	
Bé. scale, degrees	54-64	64-70	
Each	1.60	1.60	



C-405



C-407

C-405 Hygrometer—"Hygrodeik," for determining relative and absolute humidity and dew point without reference to table. Black japanned iron frame on base, scale range 20 to 120°F. Each . . . . . Net 17.50

C-407 Hygrometer—Mason. Mounted on oak board 8 1/2 x 4 1/2 in. with brass scales range approximately from 20 to 120°F with tables and directions. Each . . . . . Net 4.00

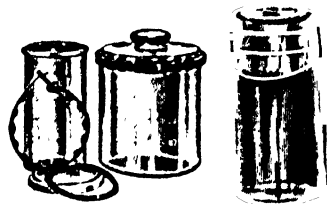
Continued on Next Page

**C-4162 Hydrometer** Standard quality, same range as No. C-4217.

Each . . . . . 2.00

**C-4202 Hydrometer** 6 inches long, without thermometer, same ranges as No. C-4217.

Each . . . . . 1.50



C-4355 80

C-4365

**C-4355 Jars—Preservation** Improved form, having perfectly straight sides with no constriction at top, provided with glass cover, fitting absolutely air tight by rubber band and hermetically held in place by metal band, an ideal jar for exhibition purposes.

	No.	A	B
Capacity, oz . . . . .	16	32	
Height, inside, in . . . . .	5½	6½	
Diameter, inside, in . . . . .	2½	3½	
Each . . . . .	.40	.47	

**C-4360 Jars—Preservation** Same as No. C-4355 above, but having cover with knob.

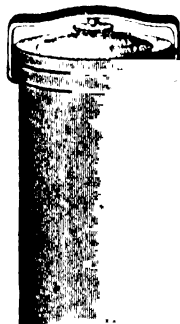
	No.	A	B	C	D
Capacity, oz . . . . .	26	52	64	80	
Height, inside, in . . . . .	6	6½	7½	8½	
Diameter, inside, in . . . . .	4½	5½	5½	6	
Each . . . . .	.50	.70	.85	1.10	

**C-4365 Jars—Preservation (Lightning)** Of greenish glass; lid clamped air-tight by spring clip.

	No.	A	B	C	D
Capacity, pints . . . . .	1	1½	2	4	
Each . . . . .	10	12	.13	18	
Per dozen . . . . .	110	130	1.40	1.90	



C-4365



C-4400

**C-4395 Jars—Specimen** Of clear, white glass, with extra wide mouth and glass stopper carefully ground in.

	No.	3	5	6	7
Capacity, oz . . . . .	3½	7	8	12	
Height to shoulder, in . . . . .	2½	5	3½	5	
Height to top of stopper, in . . . . .	4½	6½	5½	7	
Diameter of body, in . . . . .	2	2	2½	2½	
Diameter of mouth, in . . . . .	1½	1½	2	2	
Each . . . . .	.50	.63	.65	.72	

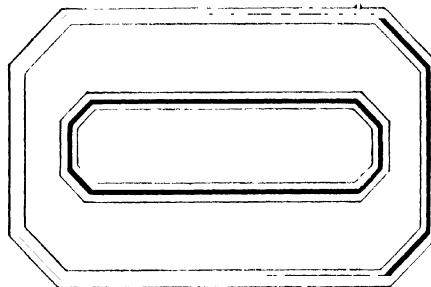
	No.	8	10	11	13
Capacity, pints . . . . .	1	1½	1½	2½	
Height to shoulder, in . . . . .	7	6	8	8	
Height to top of stopper, in . . . . .	9	8½	10½	10½	
Diameter of body, in . . . . .	2½	3	3	3½	
Diameter of mouth, in . . . . .	2	2½	2½	3	
Each . . . . .	.80	.97	1.15	1.55	

**C-4400 Jars—Specimen**—With mouth same size as body; with rubber band, metallic clamp and two glass suspension rings on under side of glass cover.

	No.	3	6	7	8
Capacity, pints . . . . .	1	1½	2½	4	
Height without lid, in . . . . .	8	6	8	12	
Diameter of mouth, in . . . . .	2½	3½	3½	3½	
Each . . . . .	1.55	2.10	2.20	2.60	

	No.	10	11	17	18	22
Capacity, quarts . . . . .	2½	4 gal	1½	2½	7	
Height without lid, in . . . . .	8	12	8	12	36	
Diameter of mouth, in . . . . .	5	5	7½	7½	7½	
Each . . . . .	3.95	4.65	7.80	8.70	15.60	



C-13910

**C-13910 Labels—Gummed** Of superior quality, printed on white paper, with red border.

	No.	A	B	C	D	E	F
Number . . . . .	223	217	213	209	205	201	
Length, mm . . . . .	20	25	30	35	45	65	
Width, mm . . . . .	15	20	25	28	35	40	
Per 12 boxes . . . . .							
Net 1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Per box . . . . .	Net .10	.10	.10	.10	.10	.10	

	No.	G	H	I	J	K	L
Number . . . . .	250	261	219	241	239	229	
Length, mm . . . . .	33	50	40	22	30	42	
Width, mm . . . . .	15	15	20	15	18	30	
Per 12 boxes . . . . .							
Net 1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Per box . . . . .	Net .10	.10	.10	.10	.10	.10	

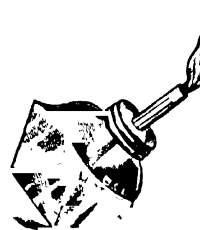
**C-13925 Labels—Microscopical**—Square, size, 22 mm.

Per box of 100 . . . . . .06

Per dozen boxes of 100 . . . . . .65

**C-13955 Label Books** Contain the names and formulas of the most commonly used chemicals and reagents. Printed on good paper, gummed and perforated and bound in book form.

Per book . . . . . .30



C-4440



C-4445

**C-4440 Lamps—Alcohol**—Of glass, with metal burner and metal cap, shape as such that lamp may be set at various angles, wick included.

	No.	A	B	C
Capacity, cc . . . . .	40	120	120	
Diameter of burner, mm . . . . .	5	7	12	
Each . . . . .	.40	.48	.53	

**C-4445 Lamps—Alcohol**—Cylindrical, of clear, white glass; with metal burner and glass cap ground on, wick included.

	No.	A	B	C
Capacity, cc . . . . .	60	100	250	
Each . . . . .	.20	.25	.33	

**C-13960 Measures—Meter Stick—** With graduations in Metric system on one side and inches on the other, fitted with metal bound ends.

Each ..... 50

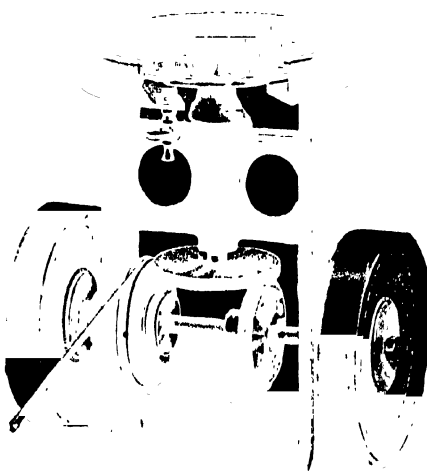
**C-13961 Measures—Boxwood Scale—** With Metric and English graduation. 12" long, one edge bevelled and accurately graduated in millimeters, the other face graduated in inches and 16ths.

Each ..... 12  
Per dozen ..... 125

## METALLOGRAPHIC APPARATUS

### Metallographic Grinding and Polishing Machine—

**Wysor** Accomplishes all operations from rough grinding to polishing for examination. Grinding wheels for roughing medium and finishing are carborundum. Polishing discs are of brass with cloth coverings and are easily replaceable on the head of vertical spindle. Spindles are friction driven from horizontal shaft which can be disengaged when not in use. Speed of discs may be varied by shifting friction wheel on shaft. Special containers for polishing powders can be supplied.



C-437

**C-437 Metallographic Grinding and Polishing Machine—Wysor**—With three polishing discs, without motor.

Each ..... Net 78.50

**C-439 Metallographic Grinding and Polishing Machine—Wysor**—Mounted on a cast-iron base with one-eighth horse-power motor.

	No. A 110 V-D.C.	B 220 V-D.C.
Each ..... Net	122.50	125.00

	No. C 110 V-A.C.	D 220 V-A.C.
Each ..... Net	122.50	125.00

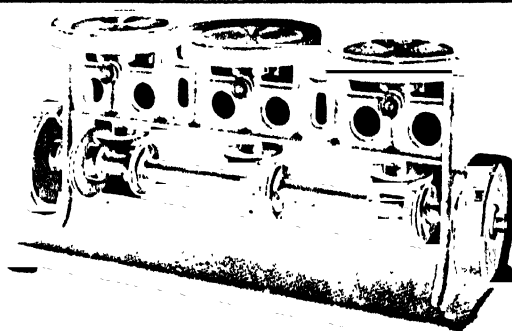
**C-441 Metallographic Grinding and Polishing Machine—Wysor**—Large size with three vertical spindles without motor. Prices on motors for use with this machine quoted on request.

Each ..... Net 120.00

For illustration see top of page

Metallurgical Microscopes listed on page 1036

Prices subject to change without notice



C-445



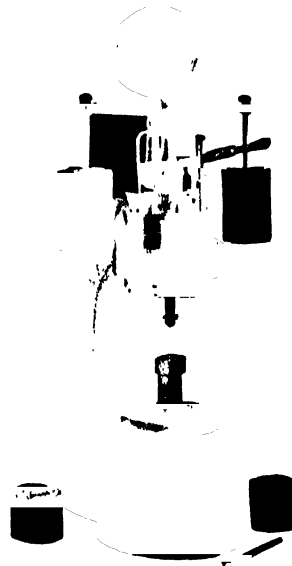
C-446

**C-445 Metallographic Grinder**—Endless belt type for grinding, polishing and finishing of metal, hard rubber and similar specimens. Equipped with idler pulley, tight and loose pulley, belt shutter and grinding rest. Complete with three grinding belts of varying degree of fineness.

Each ..... Net 55.00

**C-446 Vertical Disc Wheel Attachment for above**

Each ..... 5.50



C-450

**C-450 Brinell Hardness Tester**—For determination of the degree of hardness of metals by measuring the impression made by the pressure of a hardened steel ball on the smooth surface of the metal. Impression can be measured by optical means by vertical magnifier or Brinell microscope, or by mechanical means with depth gauge. For 3000 Kg. pressure, with control weights but without microscope, magnifier or depth gauge.

Each ..... Net 330.00

This instrument can be supplied with three different distances between steel ball and screw table of 6 1/2", 12 1/2" and 19".

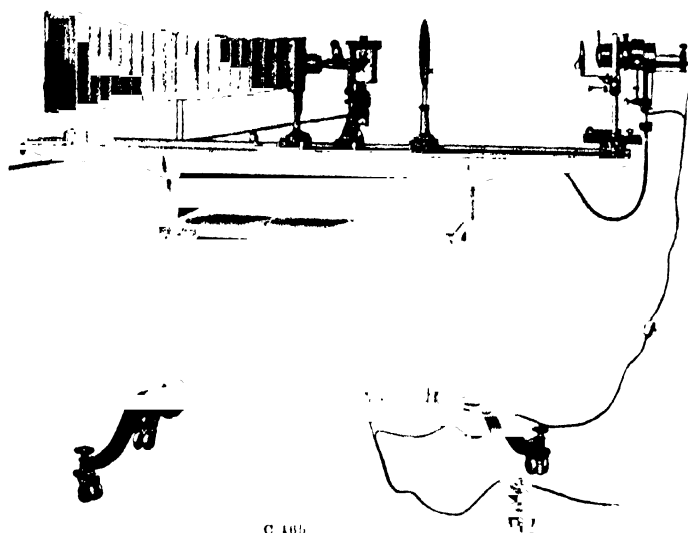
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**C-453 Depth of Impression Attachment** Permits of depth reading to 1/100 mm. for use with above Brinell Tester.

Each ..... Net \$2.50

**C-455 Brinell Microscope** A compound microscope with sliding focusing tube carrying a Kaiden eyepiece and with a 32 mm. achromatic objective fitted with a 7 mm. micrometer disc graduated in tenths of a millimeter.

Each ..... Net \$38.50



C-455

**C-465 Microphotographic Outfit—Type GSA-1L9—B. & L.**

The 1L inverted microscope is of heavy rigid construction, horizontal body tube with reflecting mirror and objective carrier supported by substantial pillar, coarse adjustment by rack and pinion operated by worm gear which automatically locks when any downward pressure is put on stage, fine adjustment of standard microscope type which moves stage up or down and may be operated by extension rod and gear, stage 4" square and capable of supporting large specimens, consists of two plates the upper movable by racks and pinions in two directions at 90° to each other, a special holder with spring clip being supplied for small specimens, body tube provided with adjustable observation tube with sliding inner tube fitted with a 90° prism by which light is reflected to eyepiece of observation tube, vertical illuminator and objective mounted on sliding plate on top of reflecting box, vertical illuminator being of special type so arranged that either a clear glass or totally reflecting mirror can be used interchangeably in same mounting. The GS type of camera with this equipment is particularly desirable where great rigidity, mechanical accuracy, and use of high magnification are required, supplied with floor stand or with special short flat supports for laboratory table or embedding in a cement foundation if so specified, illuminating system consists of 5 amp., 90° hand feed arc lamp with rheostat for 110 volts or a 6 volt mazda lamp and transformer for 110 volts, a close up spheric condenser 60 mm. in diameter in focusing mount, removable iris diaphragm, support for ray filter, filters, adjustable for height on two rods with screws for vertical and lateral adjustment, supplementary condenser 36 mm. in diameter with iris diaphragm and light shield on adjustable support works in conjunction with aspheric condenser and vertical illuminator. Outfit as described with one each 32, 16 and 4 mm. achromatic objectives (corrected for uncovered objects) and short-mounted) and one pair each of 6.4x and 10x eyepieces.

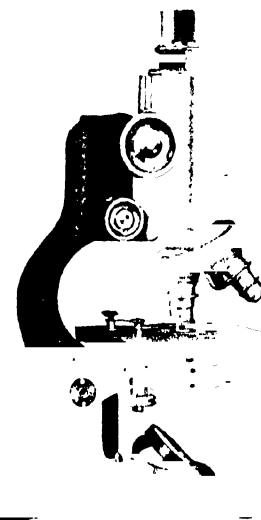
Price ..... 715.00

**C-467 Microphotographic Outfit—GSM-1L9** Same as above but with six volt mazda lamp and transformer in place of arc lamp.

Price ..... 705.00

The above is representative of a complete line of photomicrographic apparatus that we carry. Illustrated booklet on request.

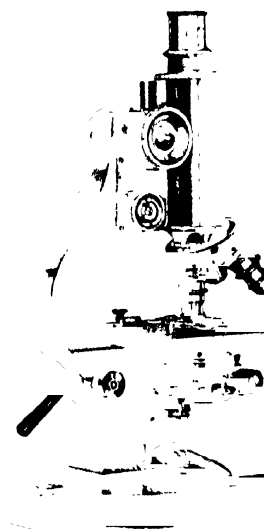
## MICROSCOPES AND MAGNIFIERS



C-13985

**C-13985 Microscope FFS—B. & L.**—Coarse adjustment by standard rack and pinion, provided with stop to prevent pinion from over-riding rack, side fine adjustment is of lever type with micrometer head on both sides of arm; stage completely covered with metal except at point of attachment and measures 102 x 102 mm.; substage adjustable for focus by quick acting screws. Furnished in hard wood case with optical equipment as listed below.

Objectives		Eyepieces	Nosepiece
Dry	Oil Immersion	5x 10x	Circular Triple
16 mm 4mm	19mm		
Abbe Condenser		120 N.A.	
Each			132.00



C-14015

Prices subject to change without notice

Continued on Next Page

- C-14015 Microscope CAS**—Large model with 39 mm. body tube and pillar of rectangular cross section with double bearing inclination joint and clamping lever, fine adjustment heads graduated to read 25 microns of vertical movement. Stage 116 x 108 mm. with a distance of 87 mm. from center to arm at stage surface; substage furnished with swing out condenser which may be swung down so as to facilitate the use of illumination by mirror alone; mirror to diaphragm being prevented by a locking device. Furnished in hard wood case with optical equipment as listed below.

	Objectives	Eyepieces	Nosepiece
Dry	Oil Immersion		
16 mm 4 mm	19 mm	5x 10x	Circular Triple
	Abbe Condenser		
	1.20 N.A.		
Each			192.00



C 14070

- C-14070 Microscope CAE—Binocular, B. & L.**—This binocular microscope of parallel tube and mono objective type uses all regular optics of all powers including oil immersion objective. Body tube has special prism system fitted with two parallel eyepiece tubes, separation of which is varied by the mill head between and the interpupillary distance indicated on the millimeter scale. Side fine adjustment, stage 116 x 108 mm. is of metal, completely covered with vulcanized rubber except at point of attachment. Substage furnished with swing-out condenser. Furnished in hard wood case with optical equipment as listed below.

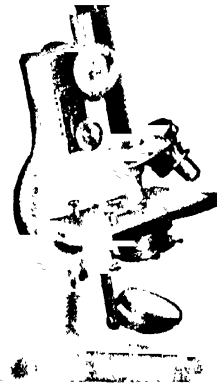
	Objectives	Paired Eyepieces	Nosepiece
Dry	Oil Immersion	Huygenian	
16 mm 4 mm	19 mm	5x 10x	Circular Triple
	Abbe Condenser		
	1.20 N.A.		

Each ..... 270.00

- C-14072 Microscopes CAE—Binocular B. & L.**—Same as No. C-14070, but without oil immersion objective and with circular double nosepiece.

Each ..... 225.50

- C-14088 Stereoscopic Eyepiece—B. & L.**—A newly designed eyepiece making possible the rapid conversion of any monocular microscope into a binocular and thus obtaining a very pronounced stereoscopic effect and an observation of detail that might easily escape the eye when using a monocular model. There is a complete absence of eye fatigue even when working steadily for hours, interpupillary distance being adjustable, because of increased tube length objectives give nearly double their ordinary magnifications, stereo-

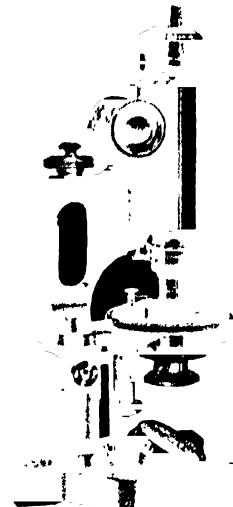


C 14088

scopic effect is further enhanced by a set of eyepiece cap diaphragms with semi-circular openings, these being adjustable for the eyepoint of the eyepiece. Threaded collar ordinarily supplied will fit the B. & L. Models E, FE, FES, FCS, or FDS, and special adapters can be supplied for other types of old models. Finished in alcohol proof crystal black with two 64x matched eyepieces, eyepiece cap diaphragms and case.

Each ..... 50.00

Adapters for other models and threaded collars for other makes can be supplied. Prices upon request. Special circular upon application.



C 475

- C-475 Microscope—Chemical—B. & L.**—Designed by Professor E. Chanot for microchemical analysis, with circular revolving stage graduated on the circumference with single degrees. Arm of handle type, 34 mm. diameter body tube with coarse adjustment by standard rack and pinion with stop to prevent pinion from overridding rack, fine adjustment of lever type with two sized knurled head for slow and rapid movement, ceasing to operate when objective touches slide. Substage adjustable for focus by quick acting screw consists of mounting for polariser which is swung to left of optical axis when screw reaches limit of motion downward, analyzer consists of Thompson prism mounted in revolving collar.

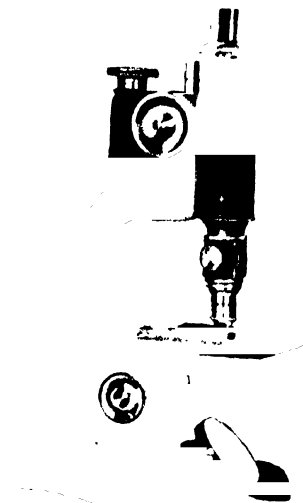
graduated in two degree division and can be immediately removed for insertion of microscope eyepiece. Entire instrument finished in durable black, in hardwood case with following optical equipment: 16 mm., 8 mm. Achromatic Objectives, 10x, 12.5x Cross hair Eyepieces.

Each . . . . . 140 00

- C-478 Microscope—Chemical—B. & L.** Same as above but with two quick changing nosepiece rings.  
Each . . . . . 151 00

- C-480 Microscope—Chemical—B. & L.** Same as No. C-475 above but with 32 mm., 16 mm. and 8 mm. achromatic objectives, 5x, 7.5x, 10x and 12.5x, Cross hair Eyepieces and with three quick changing nosepiece rings.  
Each . . . . . 174 50

- C-481 Auxiliary Stage, fitting substage of above microscopes for use in metallurgical work.**  
Each . . . . . 6 25



C-487

- C-487 Microscope—Metallurgical—FM—B. & L.** After design by Dr. Albert Sauvour. Stage adjustable vertically by standard rack and pinion to increase working distance and allow focusing without displacing vertical illuminator with reference to light source. Vertical illuminator of plain glass reflector type readily adjustable. Coarse adjustment by standard rack and pinion with top fine adjustment in hardwood case with 16 and 4 mm. objectives and 7.5x eyepiece.  
Each . . . . . 120 00

- C-489 Microscope—Metallurgical—FM—B. & L.** Same as above, but with 16 and 4 mm. objectives and 5x and 10x eyepieces.  
Each . . . . . 122 50

Objectives in above outfits are in regular size mounts, 4 mm. objectives being specially corrected for uncovered objects. If objectives with short mounts are desired add \$350 for each objective.

- C-494 Microscope—Metallurgical—FSM—B. & L.** Of Sauvour design and unexcelled for high grade work. Of similar construction to No. C-487 above, but with side fine adjustment and pillar provided with broad double bearing inclination joint having vertical and horizontal stop, body tube 39 mm. and vertical illuminator of plain glass reflector type provided with threaded aperture to receive condenser tube when this is ordered. Circular stage adjusted vertically by standard rack and pinion 78 mm. in diameter with 40 mm. aperture of metal with vulcanite top provided with centering screws and spring



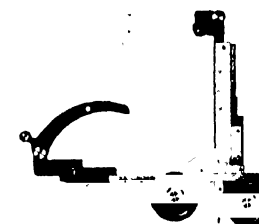
C-494

clips removable for substitution of mechanical stage. In hard wood case with 16 and 4 mm. achromatic objectives and 5x eyepiece.

Each . . . . . 198 00

- C-496 Microscope—Metallurgical—FSM—B. & L.** Same as above, but with 16 mm. and 4 mm. objectives and 5x and 10x eyepieces.  
Each . . . . . 200 50

- C-498 Microscope—Metallurgical—FSM—B. & L.** Same as No. C-494 above, but with 32 mm., 16 mm. and 4 mm. objectives and 5x and 10x eyepieces.  
Each . . . . . 207 00



C-14135

- C-14135 Mechanical Stage—Bausch & Lomb.** For use on microscopes with square-cornered stages, clamp is adjustable, front portion having top plate for instant leveling of stage, adjustment is by rack and pinion, giving equal speeds in both movements, slide-holder is provided with adjustable stops, main parts neatly finished in black lacquer to prevent reflections, scales are engraved on fine German silver.  
Each . . . . . 27 50

- C-14137 Mechanical Stage—B. & L.** This stage is for use on metallurgical microscope FSM. Adjustments are similar to those of No. C-14135, but are mounted on stage plate so as to be interchangeable with the plain revolving stage regularly supplied with microscope FSM.  
Each . . . . . 42 00

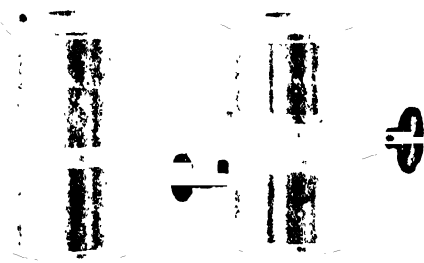
- C-14155 Micrometers, Stage—B. & L.** Consist of slides measuring 75 x 25 mm. upon which the scales are mounted, the ruling being of a high degree of accuracy, in case

	No. A	B	C
Material . . . . .	Glass	Glass	Metal
Ruled to . . . . .	0.1 to 0.01 mm.	0.01 to 0.001 mm.	0.1 to 0.01 mm.
Each . . . . .	5.00	3.50	14.50

Prices subject to change without notice

Continued on Next Page





- C-14150 Micrometer Eyepieces—B. & L.**—Furnished in two forms, one with fixed and the other with movable scale. Scale is divided into tenths of a millimeter with every fifth and tenth line longer than the others and every tenth line numbered.
- |               | No. A | B       |
|---------------|-------|---------|
| Magnification | 75x   | 75x     |
| Scale         | Fixed | Movable |
| Each          | 8.00  | 13.25   |



C-14165

- C-14165 Camera Lucida—Abbé, B. & L.**  
 Camera equipped with clamping screw conveniently placed so that it can be easily raised or lowered on eyepiece tube. prism is of Abbé type, mounted on closed case.

fixed in optical alignment, mirror is in fixed position close to prism, set at an angle of 30° from the horizontal.

Each . . . . . 14.50

Two recent modifications of the Camera Lucida can be supplied, prices and descriptive matter upon application.

- C-14106 Lens Paper**—Of finest quality for cleaning and polishing lenses. In books of fifty sheets, 8 1/2 x 12 1/2 cm.  
 Each . . . . . 12
- C-14107 Lens Paper**—Same quality as No. C-14106, but in packages of 100 sheets.  
 Size, in . . . . . 18 x 12 9 x 12  
 Each . . . . . 1.20 .60



C-14270

- C-14270 Microscope Lamp, Adjustable—Bausch & Lomb**—This contains a 6-volt, 24-watt, gas-filled mazda, a new development in illumination, the filament is so concentrated that the light approximates the ideal point-source; lamp socket is carried in a sliding plate which runs the length of the

housing and permits the lamp to be adjusted with reference to the condenser; condensers are of two types, either the ordinary bi-convex or our aspheric type; current can be drawn from any lamp socket, using a transformer on alternating current and rheostat on direct current, furnished with regular spherical condensing lens and transformer for 110 volt, AC circuit.  
 Each . . . . . 23.50

**6-volt, 24-watt, gas-filled mazda Lamp**—For use with above lamp, bulb only.  
 Each . . . . . Net 1.25

- C-14275 Microscope Lamp—Adjustable, Bausch & Lomb**—Same as No. C-14270 above, but with Aspheric Condenser, which is corrected for spherical aberration.  
 Each . . . . . 35.50
- C-14280 Microscope Lamp, Adjustable—Bausch & Lomb**—Same as No. C-14270, but with rheostat for 110 volts DC or AC circuits in place of transformer.  
 Each . . . . . 24.50
- C-14285 Microscope Lamp—Adjustable, Bausch & Lomb**—Same as No. C-14280 above, but with Aspheric Condenser, which is corrected for spherical aberration.  
 Each . . . . . 36.50



C-14325

- C-14325 Microscope Illuminator—Silverman's**—Can be used in practically every field of microscopy, consists of a circular source of light surrounding the objective and furnishing a diffused and uniform illumination at the spot to be examined, absorption disk is of blackened brass, furnished with tungsten lamp, flexible cord with attachment plug for connecting electric light socket with rheostat, stage adapter and rheostat for 104 to 124 volts.  
 Each . . . . . Net 45.00

- C-14330 Microscope Illuminator—Silverman's**—Same as No. C-14325 above, but with rheostat for 208 to 248 volts.  
 Each . . . . . Net 46.00
- Extra Lamps.** Colorless glass.  
 Each . . . . . Net 4.00
- Extra Lamps.** "Daylight" (blue) glass.  
 Each . . . . . Net 4.50  
 (Please state voltage and current when ordering.)



C-14335

- C-14335 Microscope Substage Lamp—Bausch & Lomb**—Is of unusual compactness and efficiency, complete outfit is placed under the microscope stage, the mirror being turned aside so that lamp sends its rays directly to the specimen, illuminant is small 15-watt mazda lamp, 110-115 volts, direct or altering current, connecting with any

Prices subject to change without notice

Continued on Next Page

lamp socket, housing of metal, has double, ventilated sides and top; deep curve reflector hood behind lamp bulb; inter-etc. the illumination, furnished with five and one-half feet of alk. wound cord with plug, one blue glass and one ground glass.

Each . . . . . 6.00

**Resistance Unit** For use with 15 watt, 110 volt lamp on 220 volt circuit

Each . . . . . 4.25

**15 watt Lamp** Bulb only for use with above Lamp

Each . . . . . Net 1.00

**C-14338 Microscope Substage Lamp**—Bausch & Lomb Same as No. C-14335 above, but with Corning "Day-lite" glass in place of blue and ground glasses

Each . . . . . 7.00

**C-14355 Microscopic Cover Glasses** Of superior quality, true to size, uniform in color and smoothly cut, No. 1 thickness varies from 0.13 to 0.17 mm., No. 2 from 0.17 to 0.25 mm., No. 3 from 0.25 to 0.50 mm., approx. 100 in a box or in half ounce packages

	No. A	B	C	D	E
Size, in mm.	18	18	18	22	22
Thickness	No. 1	No. 2	No. 3	No. 1	No. 2
Per oz.	1.25	1.10	1.00	1.25	1.10
	No. F	G	H	I	
Size, in mm.	25	25	25	25	
Thickness	No. 3	No. 1	No. 2	No. 3	
Per oz.	1.00	1.25	1.10	1.00	

**C-14360 Microscopic Cover Glasses—Round** Same sizes and prices as No. C-14335 above

**C-14375 Microscopic Object Slides** Made of domestic crown glass, free from defects, of uniform thickness and color, with edges ground, object slides of selected measured thickness will be furnished at prices double those listed

	No. A	C	E
Size, in mm.	25 x 75	25 x 75	50 x 75
Thickness	Medium	Extra Thin	Medium
Color	Half White	Half White	Half White
Per gross	1.85	1.90	2.50



C-14380

**C-14380 Object Slides** For culture work and hanging drop preparations, with concave depression, ground in slide and polished, regularly supplied in packages of ten, size 25 x 75 mm., medium thickness

Per ten . . . . . .75

**C-14405 Microscopic Slide Boxes**—Substantially made of light wood; supplied with index and label for recording titles, covers fit tight inside the edges

	No. A	B
Capacity	12	25
Size of slides, in mm.	25 x 75	25 x 44
Per 10	1.25	2.00



C-14410

**C-14410 Microscopic Slide Boxes** Same as No. C-14405 above, but with covers that fit over the top, so that when they are removed the slides, projecting above the box edges, can be easily removed

	No. A	B
Capacity	25	25
Size of slides, in mm.	50 x 75	25 x 75
Per 10	3.25	1.75

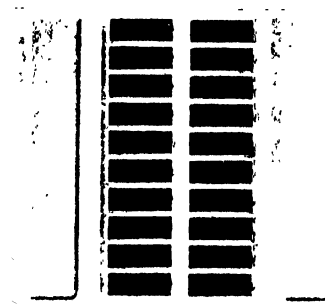
Prices subject to change without notice



C-14415

**C-14415 Microscopic Slide Boxes** A very compact and convenient slide box, made of wood and heavy cardboard, suitably covered, provided with numbered slide index, and register for recording data of interest, cover is hinged and fitted with catches, and when raised exposes slides so that they can be removed easily, box is divided into two rows, with a capacity for 100 slides, size of slides, 25 x 75 mm.

Each . . . . . .90



C-14427

**C-14427 Slide Trays—Map Form**—Of double weight, heavy cardboard, the inserts for the slides having a white background and an impression to facilitate the removal of the individual slides. To contain fourteen slides in two rows

Each . . . . . .40

**C-14429 Slide Trays—Map Form**—Same as above, but to hold twenty slides

Each . . . . . .45



C-420

C-422

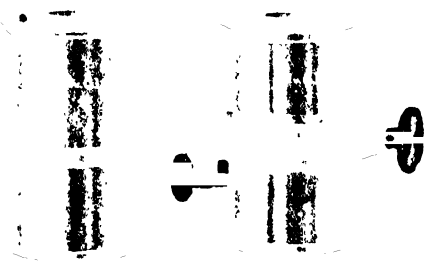
**C-420 Magnifiers—Coddington**—In metal mounting, folding, very powerful

	No. A	B	C	D
Magnification	7x	10x	14x	20x
Equivalent focus, mm.	38	25	19	13
Each	3.25	3.25	3.25	3.25

**C-422 Magnifiers—Triple Aplanates**—Composed of two meniscus lenses of flint glass separated by a double convex lense of crown glass. Field is large and flat and correction for aberration is perfect

	No. A	B	C	D
Magnification	7.5x	10x	15x	20x
Equivalent focus, mm.	34	25	17	13
Each	6.50	6.50	6.50	6.50

Continued on Next Page



- C-14150 Micrometer Eyepieces—B. & L.**—Furnished in two forms, one with fixed and the other with movable scale. Scale is divided into tenths of a millimeter with every fifth and tenth line longer than the others and every tenth line numbered.
- |               | No. A | B       |
|---------------|-------|---------|
| Magnification | 75x   | 75x     |
| Scale         | Fixed | Movable |
| Each          | 8.00  | 13.25   |



C-14165

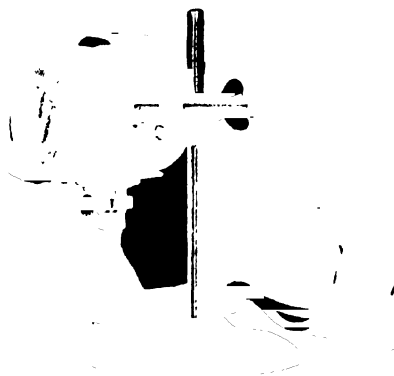
- C-14165 Camera Lucida—Abbé, B. & L.**  
 Camera equipped with clamping screw conveniently placed so that it can be easily raised or lowered on eyepiece tube. prism is of Abbé type, mounted on closed case.

fixed in optical alignment, mirror is in fixed position close to prism, set at an angle of 30° from the horizontal.

Each . . . . . 14.50

Two recent modifications of the Camera Lucida can be supplied, prices and descriptive matter upon application.

- C-14106 Lens Paper**—Of finest quality for cleaning and polishing lenses. In books of fifty sheets, 8 1/2 x 12 1/2 cm.  
 Each . . . . . 12
- C-14107 Lens Paper**—Same quality as No. C-14106, but in packages of 100 sheets.  
 Size, in . . . . . 18 x 12 9 x 12  
 Each . . . . . 1.20 .60



C-14270

- C-14270 Microscope Lamp, Adjustable—Bausch & Lomb**—This contains a 6-volt, 24-watt, gas-filled mazda, a new development in illumination, the filament is so concentrated that the light approximates the ideal point-source; lamp socket is carried in a sliding plate which runs the length of the

housing and permits the lamp to be adjusted with reference to the condenser; condensers are of two types, either the ordinary bi-convex or our aspheric type; current can be drawn from any lamp socket, using a transformer on alternating current and rheostat on direct current, furnished with regular spherical condensing lens and transformer for 110 volt, AC circuit.  
 Each . . . . . 23.50

**6-volt, 24-watt, gas-filled mazda Lamp**—For use with above lamp, bulb only.  
 Each . . . . . Net 1.25

- C-14275 Microscope Lamp—Adjustable, Bausch & Lomb**—Same as No. C-14270 above, but with Aspheric Condenser, which is corrected for spherical aberration.  
 Each . . . . . 35.50
- C-14280 Microscope Lamp, Adjustable—Bausch & Lomb**—Same as No. C-14270, but with rheostat for 110 volts DC or AC circuits in place of transformer.  
 Each . . . . . 24.50
- C-14285 Microscope Lamp—Adjustable, Bausch & Lomb**—Same as No. C-14280 above, but with Aspheric Condenser, which is corrected for spherical aberration.  
 Each . . . . . 36.50



C-14325

- C-14325 Microscope Illuminator—Silverman's**—Can be used in practically every field of microscopy, consists of a circular source of light surrounding the objective and furnishing a diffused and uniform illumination at the spot to be examined, absorption disk is of blackened brass, furnished with tungsten lamp, flexible cord with attachment plug for connecting electric light socket with rheostat, stage adapter and rheostat for 104 to 124 volts.  
 Each . . . . . Net 45.00

- C-14330 Microscope Illuminator—Silverman's**—Same as No. C-14325 above, but with rheostat for 208 to 248 volts.  
 Each . . . . . Net 46.00
- Extra Lamps.** Colorless glass.  
 Each . . . . . Net 4.00
- Extra Lamps.** "Daylight" (blue) glass.  
 Each . . . . . Net 4.50
- (Please state voltage and current when ordering.)



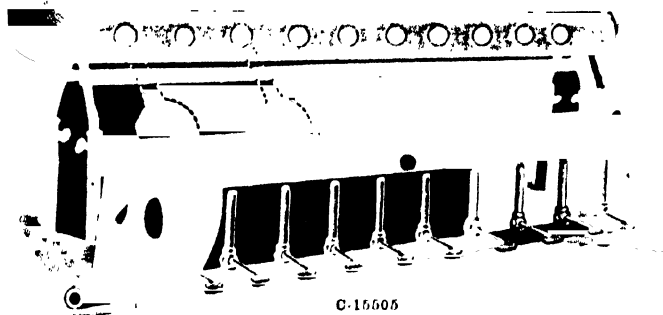
C-14335

- C-14335 Microscope Substage Lamp—Bausch & Lomb**—Is of unusual compactness and efficiency, complete outfit is placed under the microscope stage, the mirror being turned aside so that lamp sends its rays directly to the specimen, illuminant is small 15-watt mazda lamp, 110-115 volts, direct or altering current, connecting with any

Prices subject to change without notice

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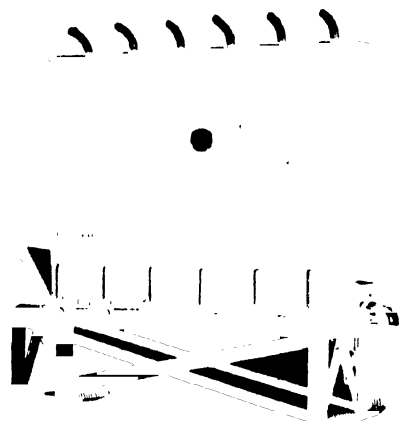
## NITROGEN DETERMINATION APPARATUS



C-15505

**C-15505 Digestion Shelf—Johnson's**—Used extensively in Agricultural Experiment Stations, necks of flasks rest in holes in lead pipe which conveys fumes to chimney, has shelf, complete without glassware

	No. A	B	C
No. of flasks	6	10	13
Length, in	20	46	60
Each	Net 60.00	82.50	97.50



C-15537

**C-15537 Distilling Apparatus—Kjeldahl's**—On stand; consists of polished heavy copper condenser tinned inside, with block tin condensing coils, with iron shelf and six adjustable burners. An ideal equipment for water, food and fertilizer work

Each ..... Net 97.50

**C-15538 Distilling Apparatus—Kjeldahl's**—Of convenient form to be hung on wall. Same as No. C-15537 above, but without table stand

Each ..... Net 90.00

**C-15525 Hot Plate, Electric—Gilmer's**—Designed particularly for Kjeldahl determinations, but is not limited to this kind of work. The parts are few, simple and replaceable without the delay usually incurred in special apparatus. There are four principal parts and ten such as nuts, bolts, terminals, etc. Constructed of hydraulic pressed asbestos and accommodates any of the ordinary laboratory vessels. Particularly adapted to agricultural chemical laboratories, where their use is indispensable. Manufactured in voltages of 55, 73½ and 110 volts, each stove consumes about 400 watts. Heating capacity is such that a regular 800 cc flask containing 450 cc. of water will be boiled and 250 cc. distilled over inside of 60 minutes. Complete.

Each ..... 8.50

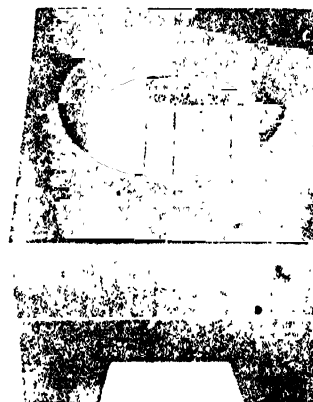
Replacement parts:

No. A. Base Plates. .... 3.20

No. B. Cover Plates. .... 2.70

Each ..... 2.70

Prices subject to change without notice



C-15525

No. C. Heating Units	2.55
Each	
No. D. Rewinding of Heating Units	2.10
Each	
No. E. Heating Unit Plate	1.00
Each	
No. F. Coiled Wire	1.70
Each	
No. G. Fahenstock Connector, single	.60
Per dozen	
No. H. Terminals, complete	1.30
Per dozen	

(Please state voltage and current when ordering.)

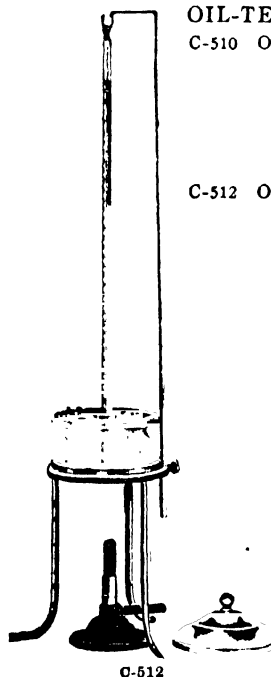
## OIL-TESTING APPARATUS

**C-510 Oil Tester—Cleveland Open-Cup**—For determination of the flash-point of lubricating or heavy oils, of heavy brass construction, without thermometer, with Bunsen burner

Each ..... 12.75

**C-512 Oil Tester—Cleveland Open-Cup**—Similar to the above but with accurate thermometer reading to about 600°F. and Bunsen burner for gas

Each ..... 15.00

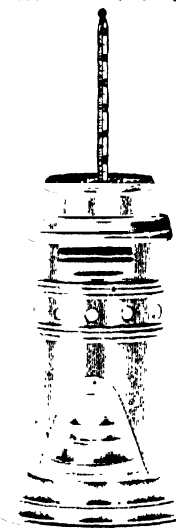


C-512

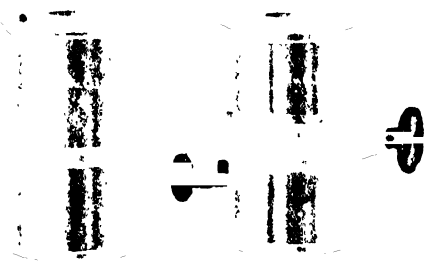
**C-514 Oil Tester—Elliott**—For flash-points of illuminating oil only, adopted as standard by the states of New York, New Jersey, Iowa and Michigan. With standard thermometer and oil lamp.

Each ..... Net 15.60

C-514



Continued on Next Page



- C-14150 Micrometer Eyepieces—B. & L.**—Furnished in two forms, one with fixed and the other with movable scale. Scale is divided into tenths of a millimeter with every fifth and tenth line longer than the others and every tenth line numbered.
- |               | No. A | B       |
|---------------|-------|---------|
| Magnification | 75x   | 75x     |
| Scale         | Fixed | Movable |
| Each          | 8.00  | 13.25   |



C-14165

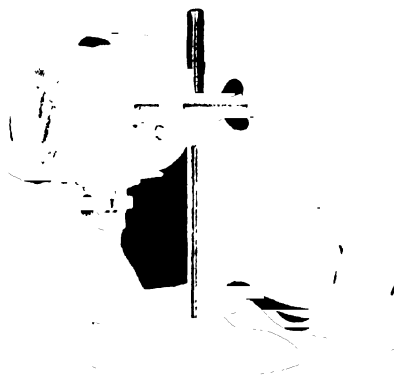
- C-14165 Camera Lucida—Abbé, B. & L.**  
 Camera equipped with clamping screw conveniently placed so that it can be easily raised or lowered on eyepiece tube. prism is of Abbé type, mounted on closed case.

fixed in optical alignment, mirror is in fixed position close to prism, set at an angle of 30° from the horizontal.

Each . . . . . 14.50

Two recent modifications of the Camera Lucida can be supplied, prices and descriptive matter upon application.

- C-14106 Lens Paper**—Of finest quality for cleaning and polishing lenses. In books of fifty sheets, 8 1/2 x 12 1/2 cm.  
 Each . . . . . 12
- C-14107 Lens Paper**—Same quality as No. C-14106, but in packages of 100 sheets.  
 Size, in . . . . . 18 x 12 9 x 12  
 Each . . . . . 1.20 .60



C-14270

- C-14270 Microscope Lamp, Adjustable—Bausch & Lomb**—This contains a 6-volt, 24-watt, gas-filled mazda, a new development in illumination, the filament is so concentrated that the light approximates the ideal point-source; lamp socket is carried in a sliding plate which runs the length of the

housing and permits the lamp to be adjusted with reference to the condenser; condensers are of two types, either the ordinary bi-convex or our aspheric type; current can be drawn from any lamp socket, using a transformer on alternating current and rheostat on direct current, furnished with regular spherical condensing lens and transformer for 110 volt, AC circuit.  
 Each . . . . . 23.50

**6-volt, 24-watt, gas-filled mazda Lamp**—For use with above lamp, bulb only.  
 Each . . . . . Net 1.25

- C-14275 Microscope Lamp—Adjustable, Bausch & Lomb**—Same as No. C-14270 above, but with Aspheric Condenser, which is corrected for spherical aberration.  
 Each . . . . . 35.50
- C-14280 Microscope Lamp, Adjustable—Bausch & Lomb**—Same as No. C-14270, but with rheostat for 110 volts DC or AC circuits in place of transformer.  
 Each . . . . . 24.50
- C-14285 Microscope Lamp—Adjustable, Bausch & Lomb**—Same as No. C-14280 above, but with Aspheric Condenser, which is corrected for spherical aberration.  
 Each . . . . . 36.50



C-14325

- C-14325 Microscope Illuminator—Silverman's**—Can be used in practically every field of microscopy, consists of a circular source of light surrounding the objective and furnishing a diffused and uniform illumination at the spot to be examined, absorption disk is of blackened brass, furnished with tungsten lamp, flexible cord with attachment plug for connecting electric light socket with rheostat, stage adapter and rheostat for 104 to 124 volts.  
 Each . . . . . Net 45.00

- C-14330 Microscope Illuminator—Silverman's**—Same as No. C-14325 above, but with rheostat for 208 to 248 volts.  
 Each . . . . . Net 46.00
- Extra Lamps.** Colorless glass.  
 Each . . . . . Net 4.00
- Extra Lamps.** "Daylight" (blue) glass.  
 Each . . . . . Net 4.50
- (Please state voltage and current when ordering.)



C-14335

- C-14335 Microscope Substage Lamp—Bausch & Lomb**—Is of unusual compactness and efficiency, complete outfit is placed under the microscope stage, the mirror being turned aside so that lamp sends its rays directly to the specimen, illuminant is small 15-watt mazda lamp, 110-115 volts, direct or altering current, connecting with any

Prices subject to change without notice

Continued on Next Page

and similar oils at 210 F.; reduce black oils at 130 F. and neutral, spindle, paraffin, red, and other distilled oils at temperatures from 70 to 212 F. Complete with flask and six thermometers without stop watch.

Each . . . . . Net 90.00

**C-547 Viscosimeter—Saybolt Universal Standard**—Same as above but with stop watch.

Each . . . . . Net 100.00

**C-549 Stop-watch only**

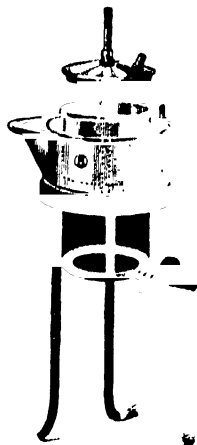
Each . . . . . Net 12.00

**C-550 Extra flasks, graduated, 60 cc.**

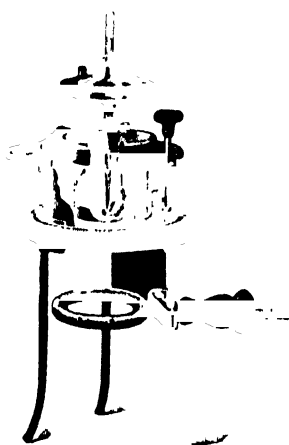
Each . . . . . Net 2.50

**C-552 Extra Thermometers for use with the above**

Each . . . . . Net 3.60



C-555



C-558

**C-555 Viscosimeter—Engler's** Latest form for light or heavy wall with oil container, gold-plated and platinum tube, ring burner and tripod, but without flask or thermometer.

Each . . . . . Net 67.50

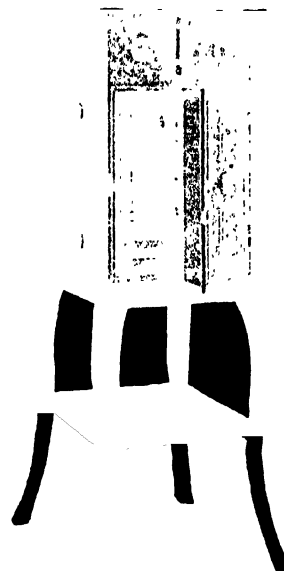
**C-558 Viscosimeter—Engler's, as modified by Ubbelohde**—For light and heavy oils with oil container, gold-plated and platinum outlet tube, with air space in lid, stirring arrangement in bath to keep temperature constant, tripod and ring burner with handle, but without thermometer or flask.

Each . . . . . Net 90.00

## Ovens

**Ovens—Freas' Electric**—Approved by the National Board of Fire Underwriters, have become favorably known for their durable construction, reliability and accuracy, and are satisfactory for long, continuous and unattended operation; are always ready for use, and are easily and quickly regulated for any desired temperature; constructed with a double wall of heavy asbestos transite, which is absolutely fireproof, with cast aluminum frame and door; air space between inner and outer asbestos walls is filled with air-cell asbestos, permitting very little loss of heat and reducing current consumption to a minimum; interior of each is fitted with shelf racks, allowing shelves to be placed at any desired height; a small electric lamp within the oven, which can be lighted at will, is used for illumination and as a pilot, small window in door permits contents to be observed without opening door; two openings on each side of oven, which can be closed if desired, give ventilation; Freas' regulator, made entirely of metal and of durable construction, so constructed that no vapor from evaporating residues can reach contact points, regulates the temperature to within a fraction of a degree; temperature range is from that of the room to 180°C and in high temperature oven, to 260°C.; heating element, wound for 600 watts and re-

quiring 250 watts to maintain a temperature of 105°C., consists of wire wound resistance plate on bottom of oven.

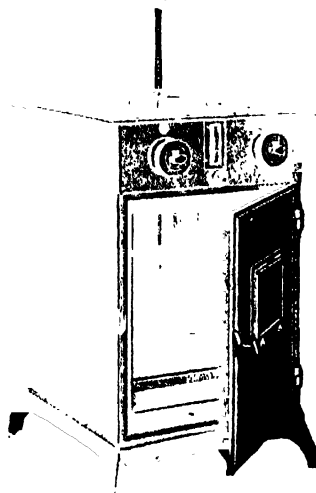


C-16000-B

**C-16000 Ovens—Freas' Electric. (Type R)**—On heavy iron base, with legs, intended for temperature to 180°C., furnished with flexible cord and plug to fit socket of ordinary lighting circuit and with high grade thermometer of special design, with graduating etched to 200°C.

	No.	A	B	C	D
Height, in . . . . .	16	18	20	22	
Width, in . . . . .	16	14	26	32	
Depth, in . . . . .	14	17	14	18	
Each . . . . .	Net 245.00	265.00	330.00	400.00	

(Please state voltage and current when ordering.)



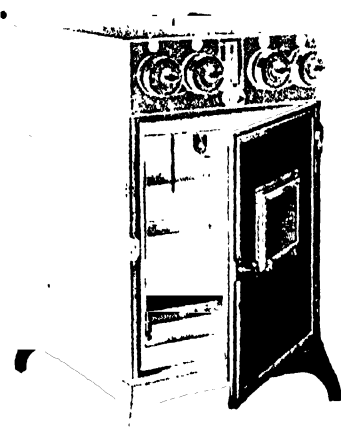
C-16005

**C-16005 Oven—Freas' Electric**—Same as above, but with cast-iron base to stand on table; height, 12 in.; width, 12 in.; depth, 12 in. inside.

Each . . . . . Net 135.00  
(Please state voltage and current when ordering.)

Prices subject to change without notice

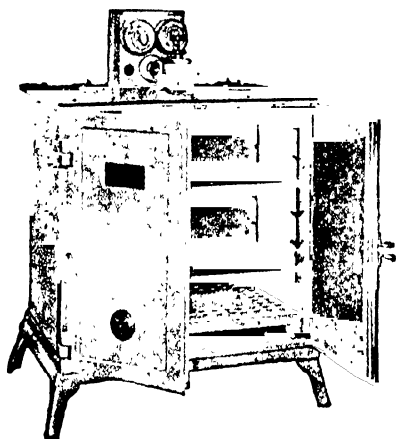
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C-16015

- C-16010 Oven—Freas' Electric—For High Temperatures—** Mounted on heavy iron base with legs, provided with two "heat" switches, one of which can be turned off when desired temperature has been reached, furnished with flexible cord and plug to fit socket of ordinary lighting circuit and with high grade thermometer of special design, with graduation etched to 300°C; inside dimensions, height, 18 in; width, 14 in; depth, 17 in.  
Each .....Net 285.00  
(Please state voltage and current when ordering.)

- C-16015 Oven—Freas' Electric—**Same as above, but with cast iron base to stand on table, inside dimensions, height, 12 in; width, 12 in; depth, 12 in.  
Each .....Net 165.00  
(Please state voltage and current when ordering.)



C-16065

- C-16065 Oven—Thelco Electric—**Substantially constructed of asbestos wood with cast aluminum frame, door frame and adjustable racks for the perforated aluminum shelves; suitable for routine laboratory work or students' use because of ease of setting and accurate maintenance of temperature, which is kept from within 1° of room heat to 160°C by the bimetallic regulator, contacts are outside the chamber; pilot lamp indicates when circuit is opened or closed; has openings in top of oven for ventilation and thermometer, and adjustable ventilators in top and door; heating plate is removable; supplied

with cord and plug ready to connect with light socket

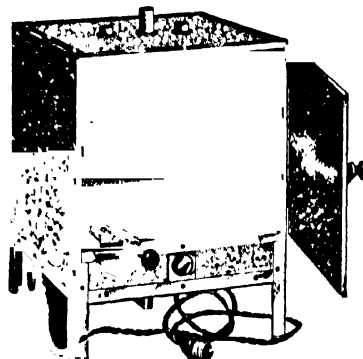
	No.	A	B
Height, cm		36	31
Width, cm		31	25
Depth, cm		46	25
Each		Net 70.00	50.00

(Please state voltage and current when ordering.)

- C-16067 Oven—Thelco Electric—Double Walled—**A new Thelco product designed along similar lines to No. C-16065 above, but with double walls permitting of more perfect heat insulation and constant temperature. Cast aluminum frame, door and racks with cast iron base, removable heating element, bimetallic thermostat with range from room temperature to 160°C placed outside oven eliminating danger of ignition when drying or evaporating ether extracts, pilot light for rapid temperature adjustment. Furnished with two shelves of adjustable height with detachable cord and plug; No. B having single door and No. A double doors.

	No.	A	B
Height, cm		41	31
Width, cm		46	25
Depth, cm		23	25
Each		80.00	60.00

(Please state voltage and current when ordering.)



C-16110

- C-16110 Oven—Drying, Electric** Constructed of asbestos compound bound with metal, special heating units can be supplied for certain kinds of work, range of temperature is from 50° to 160°C and is accurate to within 1°C; furnished with three shelves, the lower one having highest temperature; controlled without use of multiplied or lever arrangement and gives positive action, weight, 32½ lb.; height, 25 cm.; width, 31 cm.; depth, 25 cm.

Each .....Net 35.00

(Please state voltage and current when ordering.)

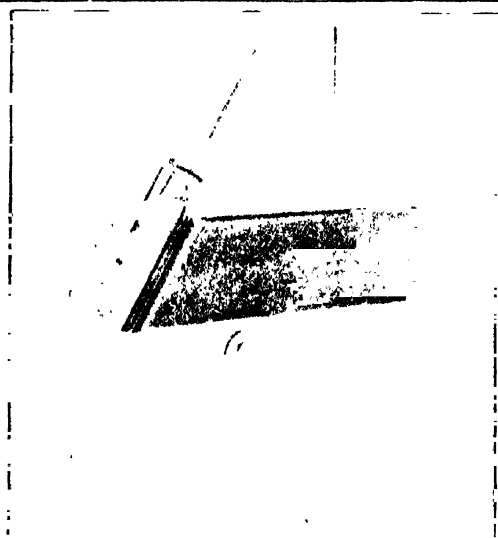
- C-16170 Oven—Vacuum—**Maintains fixed temperature from 40° to 180°C; simply but ruggedly constructed; suitable for research as well as laboratory operations; dries nearly any substance without risk of decomposing, will safely dry explosive or inflammable material; heat is applied by direct contact, making possible very rapid drying; may be used as air drying oven by opening vent cock upon door, or by opening door wide, as a hot plate for evaporation or other purposes, height from table top to heating plate, 11 in; desk space, 10 x 19 in; vacuum oven dimensions, inside, above heating plate, 7 x 15 x 3½ in high; arranged for 110 and 220 volts, alternating or direct current, furnished complete with rheostat, snap switch, extension cord and plugs, one 250° centigrade thermometer, one thermometer holder, one vacuum gauge, cocks for releasing and applying vacuum.

Each .....Net 225.00

(Please state voltage and current when ordering.)

Prices subject to change without notice

Continued on Next Page



C 16170

- C-16171 Oven—Vacuum** Same as No. C-16170 above, but 8 in. high  
Each ..... Net 250.00  
(Please state voltage and current when ordering.)
- C-16277 Pencils—Wax**—For writing on glass, china, metal, etc.; white  
Each ..... 13
- C-16282 Pencils—Wax**—For writing on glass, china, metal, etc.; blue  
Each ..... 13
- C-16284 Pencils—Wax**—For writing on glass, china, metal, etc.; red  
Each ..... 13
- C-16286 Pencils—Wax**—For writing on glass, china, metal, etc.; yellow  
Each ..... 13

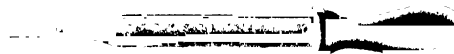


C-4585

**C-4585 Percolators** Conical Of heavy, flint glass

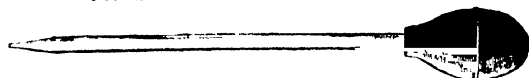
	No.	C	D	E
Capacity, oz.	32	64	gal 1	
Each		.60	.90	1.25
	No.	G	H	I
Capacity, gal	2	3	4	
Each		2.60	4.25	6.00

## PIPETTES



C 1640

- C-4640 Pipettes—Dropping** With rubber bulb, capacity, 2 cc., straight  
Per dozen ..... .30
- C-4645 Pipettes—Dropping** Same as No. C-4640 above, but with curved tip  
Per dozen ..... .30



C-4660

- C-4660 Pipettes—Dropping—Straight**, with rubber bulb of about 20 cc. capacity
- |            | No. | A   | B   |
|------------|-----|-----|-----|
| Length, mm | 200 | 300 |     |
| Each       |     | .17 | .20 |

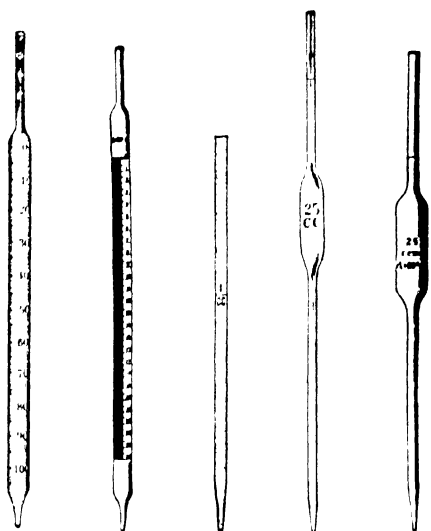
Prices subject to change without notice



C 4675

**C-4675 Pipettes—Automatic** With overflow, fitted with three-way stopcock

	No.	A	B	C	D	E
Capacity, cc.	10	15	25	50	100	
Each		3.00	3.35	3.75	4.10	4.85



C-4690

C-4700

C 4680

C-4715

C-4718

**C-4690 Pipettes—Mohr's** Accurately graduated in metric system, at 20°C

	No.	I	L	M	P
Capacity, cc.	1	2	2	5	
Graduated, cc.	1/10	1/20	1/10	1/10	
Each		.21	.24	.21	.24
	No.	S	U	V	
Capacity, cc.	10	25	50		
Graduated, cc.	1/10	1/10	1/10		
Each		.27	.36	.60	

**Pipettes—Mohr's, Serological**, graduated to the extreme tip. (No. C-4695) can be supplied where desired

**C-4700 Pipettes—Precision—Mohr's—Graduated at 20°C**, to meet the requirements of the U. S. Bureau of Standards

	No.	A	C	D	E	F
Capacity, cc.	1	5	10	25	50	
Graduated, cc.	1/100	1/20	1/10	1/10	1/5	
Each		2.50	2.90	3.60	4.35	5.00

**C-4680 Pipettes—Volumetric or Transfer—Straight form**; for use in bacteriological work, water analysis, etc.; with one mark only; without bulb.

	No.	A	B	C	D	E	F
Capacity, cc.	1	2	3	4	5	10	
Each		.14	.14	.14	.14	.14	.15

**C-4715 Pipettes—Volumetric Transfer—With glass bulb in middle of tube**; accurately graduated to capacities named.

	No.	A	B	E	I	K
Capacity, cc.	1	2	5	10	15	
Each		.16	.16	.16	.18	.25
	No.	M	N	Q	R	S
Capacity, cc.	20	25	50	75	100	
Each		.27	.29	.37	.47	.53

**C-4718 Pipettes—Volumetric or Transfer—Precision—Graduated at 20°C**, to meet the requirements of the U. S. Bureau of Standards

	No.	A	B	C	D	E
Capacity, cc.	1	5	10	25	50	
Each		1.25	1.60	1.80	1.95	2.05

Continued on Next Page



**C-5830 Plates—Color—** Coors porcelain, glazed throughout with exception of bottom surface

No.	1	2	3	4
Dimensions, mm	110 x 90	160 x 125	180 x 110	180 x 140
Number of depressions	12	12	24	30
Each	Net .84	1.14	1.62	1.80



C 5835

**C-5835 Plates—Color—** Ohio porcelain, with 12 cavities for color reactions, size of plate 110 x 90 mm.  
Each ..... Net .65



C-16320



C 16340

**C-16320 Plates—Glass, Circular—** Plain with edges not ground

No.	B	C	D	G
Diameter, mm	75	100	125	200
Each	.04	.06	.07	.12

**C-16321 Plates—Glass, Circular—** Ground rough on one side, edges not ground

No.	B	C	D	G
Diameter, mm	75	100	125	200
Each	.06	.09	.10	.16

**C-16340 Plates—Glass, Square—** Plain, edges not ground

No.	B	C	D	F
Size, mm	100	125	150	200
Each	.04	.06	.10	.12

**C-16345 Plates—Glass, Square—** One side ground rough, edges not ground

No.	B	C	D	F
Size, mm	100	125	150	200
Each	.06	.09	.12	.16

**C-16355 Plates—Cobalt Glass—** A blue glass for observing potassium flame and similar purposes, edges not ground

No.	A	B	C	E
Size, mm	50 x 50	50 x 75	75 x 75	75 x 100
Each	.06	.10	.14	.18

**C-5925 Plates, Porous—** Coors, round

No.	1	2	3
Diameter, mm	145	175	220
Thickness, mm	6	6	6
Each	Net 1.08	1.44	2.40

**C-5930 Plates, Porous—** Ohio, unglazed, circular, flat

No.	1	2	3
Diameter, mm	140	190	230
Each	.77	1.00	1.70



C-16460



C-16440



C-16445

Prices subject to change without notice

**C-16440 Pliers—Side-cutting—** Lap-joint with gun barrel handles, knurled, forged and tempered with utmost care

No.	A	B	C	D
Length, in	4	5	6	7
Each	1.40	1.50	1.60	1.90

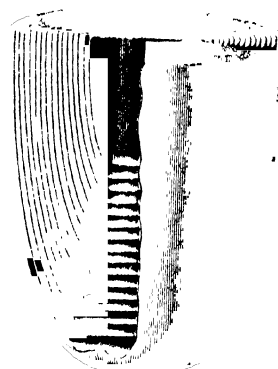
**C-16445 Pliers—Combination—** Slip-joint design permitting wider opening of pipe jaws which increases their advantages for general use, with gun barrel handles, knurled

No.	A	A1	B
Length, in	6	7	8
Each	1.05	1.30	1.55

**C-16460 Pliers—Flat Nose—** Lap-joint, with blued handles, of high quality and practically universal in their uses

No.	B	C	E	G
Length, in	3 1/2	4	5	6
Each	.90	.90	1.00	1.05

## PLATINUM WARE



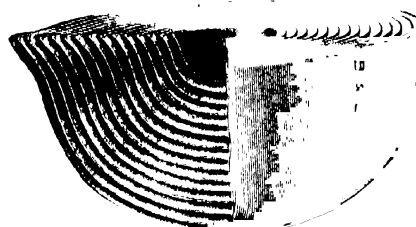
C-16375

**C-16375 Platinum Crucibles** Supplied with covers, unless otherwise ordered, weight, with covers, approximately as many grams as capacity in cc

No.	A	B	C	D	E
Capacity, cc	8	10	12	15	20
Prices on application					

No.	F	G	H	I	J
Capacity, cc	25	30	35	40	45
Prices on application					

No.	K	L	M
Capacity, cc	50	55	60
Prices on application			



C-16385

**C-16385 Platinum Dishes—Evaporating—** With lip.

No.	A	B	C	D	E
Capacity, cc	20	30	45	80	125
Weight (approx), grams	8	14	22	32	48
Prices on application					

No.	F	G	H	I
Capacity, cc	200	270	370	400
Weight (approx), grams	65	90	125	150
Prices on application				

Continued on Next Page

**C-16415 Platinum Triangles** Solid ends

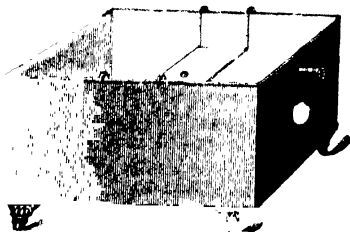
No	A	B	C	D	E	F
For crucibles of capacity, cc	10	15	20	30	40	60
Weight (approx) grams	5	8	11	12	15	18

Prices on application

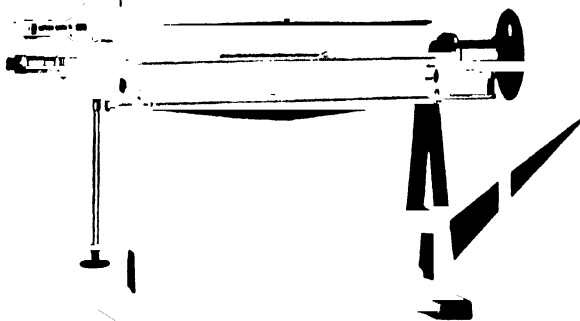
**C-16435 Platinum Wire** All sizes from 10 to 35 Brown and Sharp gauge

Platinum Cones, Gooch Crucibles, etc., can be supplied. Let us know of your requirements

Prices on application

**C-561****C-561 Pneumatic Troughs**—Of japanned tin with sliding shelf and overflow

No	A	B	C	D
Length, in	10	12	15	18
Width, in	7	9	11	12
Depth, in	5	5	6	8
Each	2.00	2.15	3.00	3.85

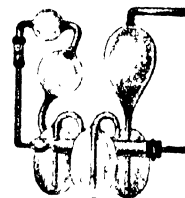
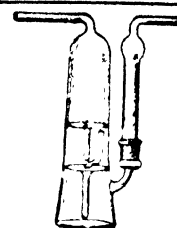
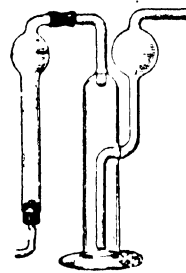
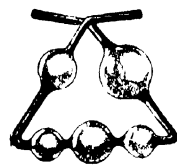
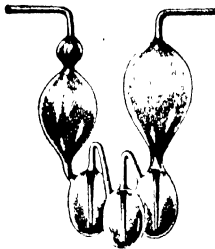
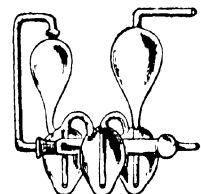
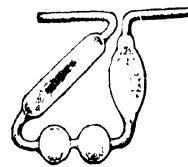
**C-570****C-570 Polariscope—Saccharimeter, Bausch & Lomb**—This instrument represents the consensus of opinions of American sugar men. It has a double field with single quartz wedge compensation and can be supplied with polarizers of two types, namely the Lippich double prism or Jellet with fixed half shadow angle; the scale is etched on glass and read by transmitted light; instrument will accommodate tubes up to 400 mm. in length, mounted on trestle support to which is attached a bracket supporting a light source; all parts easily accessible for cleaning; ordinary bichromate cell has been replaced by a glass filter of same spectral properties; scale is calibrated to read sugar degrees based on a standard weight of 26.000 grams of pure sucrose dissolved in 100 cc. of water; solution and polarization of 20°C. Half-shadow type with single quartz wedge compensator for 400 mm. tubes with illuminating device of white light, with one each 100, 200 and 400 mm. tubes, in case

Each ..... 525.00

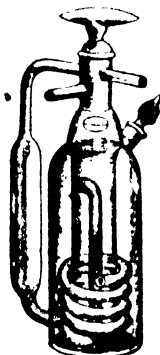
A booklet descriptive of the above saccharimeter will be supplied upon request

All high grade Polariscope, Saccharimeters, Spectrometers, Spectroscopes, and Spectrophotometers of foreign manufacture can be imported to order, but are not ordinarily carried in stock at the present time. Write us for further information.

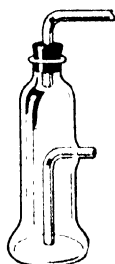
Prices subject to change without notice

**C-4765****C-4770****C-4775****C-4765 Potash Bulb—Fleming's**—Improved form, one piece Each ..... 3.50**C-4770 Potash Bulb—Geissler-Wetzel's**—With ball float valve in each of the lower bulbs, with CaCl<sub>2</sub> tube with rubber connections Each ..... 3.75**C-4775 Potash Bulb—Gomberg's**—With ground-in side tube Each ..... 3.75**C-4780****C-4785****C-4780 Potash Bulb—Johnson's** Each ..... 1.50**C-4785 Potash Bulb—Liebig's**—With five bulbs Each ..... 1.10**C-4805****C-4820****C-4805 Potash Bulb—Mohr's** Each ..... 1.90**C-4815 Potash Bulb—Mohr's**—With CaCl<sub>2</sub> tube with rubber connections Each ..... 2.60**C-4820 Potash Bulb—Mohr's**—With a CaCl<sub>2</sub> tube ground on Each ..... 2.80**C-4825****C-4830****C-4825 Potash Bulb—Nesbit's** Each ..... 5.00**C-4830 Potash Bulb—Norris'** Each ..... 1.15

Continued on Next Page



C-4835



C-4837

- C-4835 Potash Bulb and Drying-tube Combined—Vanier's.  
Each 10.00
- C-4837 Potash Bulb—Midvale type—Especially designed for use with "Ascarite"  
Each 2.00
- "Ascarite"  
Per lb. 4.50

## PUMPS



C-16530

- C-16530 Pump, Acid—Force Pump—Furnished with stopper that will fit bottles or carboys having necks of 1 1/4 to 2 1/4 in. inside diameter.  
Each 9.20



C-16560

- C-16560 Pumps, Air—Crowell's Positive Pressure Blower—Particularly useful where space is limited; horse-power required, as indicated below, is based upon pressure of about one pound per square inch, being increased proportionately for each additional pound of pressure over one pound; air tank is not absolutely necessary, but when steady, well-regulated blast of specified pressure is needed, it is preferable to direct blast into tank provided with relief valve, which can be regulated to give desired pressure, size of air pipe to convey the air should be as large as the nipple or short pipe fitted in

each blower, it is highly important that conducting pipes should not only be of suitable size but as free from elbows and turns as possible in order to minimize the power required to force the air through.

	No. 1	2	3
Cu. in. capacity per rev.	20	45	125
Max. speed per rev.	600	500	350
Pulley size, in.	4 x 4	4 x 4	6 x 2 1/2
Horse power, approx.	1/8	1/4	1/2
Max. pressure per sq. in., lb.	8	8	8
Net weight, lb.	24	34	90
Floor space, in.	10 x 6 1/2	12 x 6 1/2	22 x 14
Inlet and outlet, in.	1	1	1
Each	Net 29.00	36.00	58.00
	No. 4	5	6
Cu. in. capacity per rev.	280	400	690
Max. speed per rev.	250	200	200
Pulley size, in.	9 x 4	10 x 4	12 x 4
Horse power, approx.	1	1 1/2	2
Max. pressure per sq. in., lb.	8	8	8
Net weight, lb.	170	225	320
Floor space, in.	28 x 17	34 x 20	38 x 20
Inlet and outlet, in.	1 1/2	2	2
Each	Net 75.00	110.00	150.00
	No. 8	10	
Cu. in. capacity per rev.	1050	1600	
Max. speed per rev.	200	200	
Pulley size, in.	14 x 6	18 x 6	
Horse power, approx.	3 1/2	5	
Max. pressure per sq. in., lb.	8	8	
Net weight, lb.	575	770	
Floor space, in.	48 x 22	54 x 28	
Inlet and outlet, in.	2 1/2	3	
Each	Net 210.00	280.00	



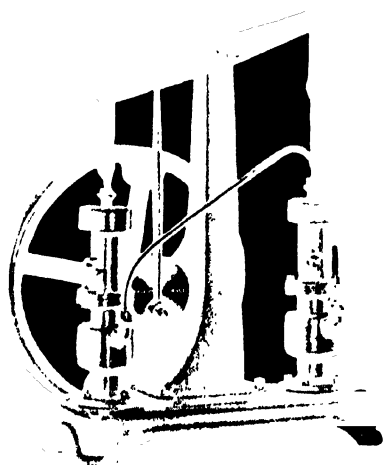
C-16615

- C-16615 Pump—Vacuum—Has large capacity, yet is compact and simple to operate, requires little power; is of positive displacement type, with all parts immersed in a bath of oil, which makes joints air-tight and lubricates moving parts, it never sucks back, making it desirable for filtration and distillation work, can be moved from place to place, size of base, 7 x 18 in., height over all, 14 in., vacuum, at sea level, 29 in.; normal speed, 400 R.P.M., displacement free air per minute, 3500 cu. in., furnished complete with pump, motor, detachable plug and 6-ft. cord for attaching to any lamp socket; for direct current

	No. A	B
Voltage	110	220
Each	Net 125.00	125.00

- C-16620 Pump—Vacuum—Same as No. C-16615 above, but for alternating current

	No. A	B
Voltage	110	220
Each	Net 125.00	125.00



C-580

**C-580 Pump—Vacuum—Geryk** Of duplex type for exacting laboratory requirements and continuous operation in plants, constructed on hydraulic principle by which friction is reduced to a minimum, working points oil sealed and self adjusting, all valves automatic, high vacuum produced much more quickly than in large Sprengel pumps, cylinders 2" diameter, stroke 5"

Each ..... Net 185 00



C-4890

**C-4890 Reductor—Jones** For the determination of phosphorus by a rapid method, as described in Blair's "Analysis of Iron" (5th edition, page 93), tube only with glass stopcock

Each ..... 2.70



C-16680

**Refractometer, Dipping—Bausch & Lomb**—This instrument excels in accuracy all other refractometers with the possible exception of the Interference Refractometer. This, combined with the simplicity of operation, makes it a highly desirable instrument. With a little experience an observer can easily repeat measurements to within 0.2 of a scale division and under favorable conditions to 0.1.

Prices subject to change without notice

The refractometer consists essentially of three parts

- 1 The Telescope
- 2 The Compensating Prism
- 3 The Dipping Prism

The scale from which the readings are taken is engraved on the plano surface on the lower lens of the eyepiece of the telescope

The compensating prism is a regular Amici prism. It is mounted in front of the objective and is rotatable about the telescope axis by means of the middle ring

The dipping prism is mounted in front of the compensating prism. It is made of a hard acid resisting crown glass. The performance of the instrument as a whole depends to a great extent upon the accuracy of the workmanship of this prism

We recommend the use of the constant temperature tank in connection with the refractometer. It enables one to take measurements much more conveniently and quickly and the results obtained are more satisfactory. If several liquids are to be compared they can be easily brought to the same temperature by placing the beakers containing the liquids in the rack in the tank

The instrument is packed in a neat wooden case for protection and easy transportation, and is furnished with transposition tables and directions

**C-16680 Dipping Refractometer, in case with tables**

Each ..... 200.00



C-590

**C-590 Refractometer—Abbé, Bausch & Lomb**—The most satisfactory instrument for the determination of refractive indices from 1.3000, to 1.7000, this large range making it a practically universal application for fluids, solids and plastic body. Can be used with white light and dispersion measured directly. A few drops only needed for examination and refractive index read direct on sector. With heatable prisms complete with screw thread thermometer, 0° to 75°C, bottle of monobromonaphthalene, screw driver and test plate, in case

Each ..... 320.00

**C-593 Spiral Water Heater, copper, for use with above**

Each ..... 45.00

**C-596 Water pressure regulating tank—For wall, for use with the above**

Each ..... 5.00

**C-599 Water pressure regulating tank—For table, for use with the above.**

Each ..... 4.00

**C-600 Stem Thermometer—Scale range 0°-75°C, divided in 1/1° with threaded adapter**

Each ..... 2.75

A booklet descriptive of this refractometer will be forwarded on request.

**C-16680-A Auxiliary Prism, for very small samples.**

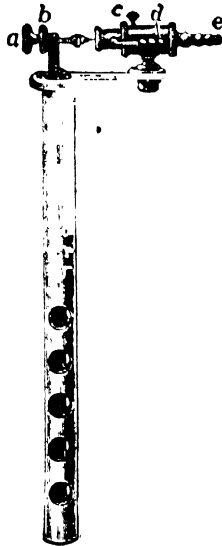
Each ..... 9.00

**C-16680-B Heating Trough, with glass plate in bottom, mirror and 24 beakers.**

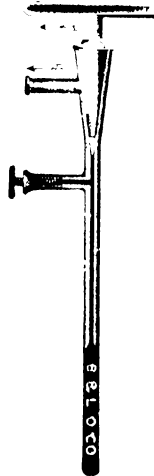
Each ..... 23.00

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- C-16680 Extra beakers.  
Each .12
- C-16680-D Steam Thermometer, 15" 20" divided in 1.5",  
8 in. long, with 5 in. section of scale, with red  
line at 17.50 C.  
Each 4.50
- C-16680-E Spiral Water Heater (copper)  
Each 45.00
- C-16680-F Water-Pressure Regulating Tank, for wall  
Each 5.00

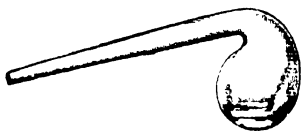


C-16698



C-16730

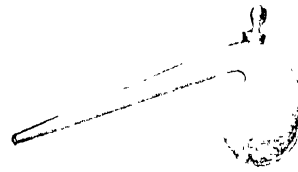
- C-16697 Regulator, Roux Bimetallic—An accurate regulator  
made without the use of mercury or glass, most  
accurate of the gas regulators, yet simple in  
operation, can be adjusted to regulate an even  
temperature more constantly than others. Large  
size.  
Each 15.20
- C-16698 Regulator, Roux Bimetallic—Small size  
Each 13.50
- C-16700 Regulator, Roux Bimetallic—For high tempera-  
tures.  
Each 18.50
- C-16730 Regulator, Thermo—Reichert's—For high tempera-  
tures.  
Each 3.50
- C-16735 Regulator, Thermo—Reichert's—For low tempera-  
tures.  
Each 3.50
- C-16740 Regulator, Thermo—Reichert's—Short form for wa-  
ter baths.  
Each 3.50



C-4895

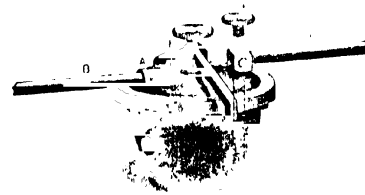
- C-4895 Retorts—Of glass, plain
- | No.          | C   | E   | F   | G    | H    |
|--------------|-----|-----|-----|------|------|
| Capacity, cc | 75  | 150 | 250 | 500  | 1000 |
| Each         | .70 | .80 | .90 | 1.00 | 1.25 |
- C-4897 Retorts—Pyrex—With tubulature, but without stop-  
cock
- | No.          | A    | B    | C    | D    |
|--------------|------|------|------|------|
| Capacity, cc | 125  | 250  | 275  | 500  |
| Each         | 1.60 | 2.00 | 2.50 | 3.00 |

Prices subject to change without notice



C-4900

- C-4900 Retorts—With ground glass stopper
- | No.          | C    | D    | E    | F    | G    |
|--------------|------|------|------|------|------|
| Capacity, cc | 150  | 180  | 250  | 500  | 1000 |
| Each         | 1.30 | 1.50 | 1.60 | 1.80 | 2.00 |
- C-4902 Retorts—Pyrex—With ground glass Pyrex stopper
- | No.          | A    | B    | C    | D    |
|--------------|------|------|------|------|
| Capacity, cc | 125  | 250  | 275  | 500  |
| Each         | 2.60 | 3.00 | 3.50 | 4.00 |



C-605

- C-605 Retorts—Skidmore Crucible—Of thin spun iron which  
permits of rapid cooling, with clamp and dis-  
tillation tube
- | No.          | A    | B    |
|--------------|------|------|
| Capacity, oz | 1.5  | 6    |
| Each         | 1.40 | 2.10 |



C-16770



C-16780

- C-16770 Rings—Concentric—Of copper, turned inside, for  
water baths, etc., with cover
- | No.                   | A   | B    | C    | D    |
|-----------------------|-----|------|------|------|
| No. in set            | 3   | 4    | 5    | 5    |
| Diameter, outside, mm | 100 | 125  | 140  | 150  |
| Per set               | .95 | 1.10 | 1.30 | 1.45 |
- | No.                   | E    | F    | G    |
|-----------------------|------|------|------|
| No. in set            | 7    | 8    | 9    |
| Diameter, outside, mm | 200  | 250  | 300  |
| Per set               | 2.50 | 4.25 | 7.50 |
- C-16780 Rings—Support—With extension, to be used with  
clamp holder
- | No.          | A   | B   | C   | D   |
|--------------|-----|-----|-----|-----|
| Diameter, mm | 75  | 100 | 130 | 175 |
| Each         | .15 | .17 | .20 | .26 |



C-16785



C-16790

- C-16785 Rings—Support—Applicable to any support; with  
clamp
- | No.          | A   | B   | C   | D   |
|--------------|-----|-----|-----|-----|
| Diameter, mm | 75  | 100 | 130 | 175 |
| Each         | .23 | .26 | .28 | .38 |
- C-16790 Rings—Of cast iron, with clamp for use on retort  
stand, to support funnels, dishes, etc., etc
- | No.                   | A    | B    |
|-----------------------|------|------|
| Diameter, outside, mm | 150  | 200  |
| No. in set            | 3    | 4    |
| Each                  | 1.05 | 1.35 |

Continued on Next Page



C-17595

**C-17595 Rings, Suberite** For supporting flasks, dishes, etc., are superior to straw rings commonly used for this purpose, being neater and more durable.

	No.	A	B	C	D	E	F
Diam (inside), mm		30	60	90	120	150	180
Each		.40	.80	.90	1.60	1.90	2.25



C-16795



C-16800

**C-16795 Rubber Bulbs** Of pure gum, for small pipettes.

	No.	A	B	D
Capacity, cc		2	3	10
Per dozen		.20	.22	.30

**C-16800 Rubber Bulbs** For large pipettes, syringes, etc.

	No.	A	B	C
Length, mm		60	80	90
Diameter, mm		32	.38	.45
Each		.20	.24	.26



C-16860

**C-16860 Rubber Stoppers** Pure gum, best quality, will not harden, unsurpassed in purity and resistance to chemicals, supplied solid, unless ordered with one or two holes, length, 25 mm.

	No.	00	0	1	2	3
Diameter, top, mm		14	17	18	20	23
Diam, bottom, mm		10	12	15	16 1/2	18
Approx. number with two holes, in one lb		148	101	67	59	44
Per pound		1.10				
	No.	4	5	6	7	8
Diameter, top, mm		25	27	32	37	41
Diam, bottom, mm		20	23	26	30	33
Approx. number with two holes, in one lb		36	32	22	15	13
Per pound		1.10				
	No.	9	10	11	12	13
Diameter, top, mm		45	50	56	65	70
Diam, bottom, mm		37	42	50	59	60
Approx. number with two holes, in one lb		11	8	7	5	4
Per pound		1.10				

**C-16865 Rubber Tissue** Of best quality.

Per oz		30
Per lb		4.00

**C-16870 Rubber Tubing** Black, pure gum, best quality, seamless, will not harden, very desirable, original length, 3 1/2 meters (12 ft).

	No.	A	B	C	D
Diameter, inside, mm		3	4	5	6
Per foot		.04	.04	.06	.10
	No.	E	F	G	H
Diameter, inside, mm		8	9	12	
Per foot		.12	.14	.22	

**C-16875 Rubber Tubing**—Black, same as No. C-16870 above, but heavy wall.

	No.	A	B	C	D	E
Diam, inside, mm		3	4	5	6	8
Per foot		.07	.08	.14	.15	.20
	No.	F	G	H	I	
Diam, inside, mm		9	12	15	18	
Per foot		.23	.42	.48	.65	

**C-16880 Rubber Tubing**—Pure gum, very elastic, for Gooch crucibles.

	No.	A	B	C	D	E
Diameter, mm		25	.30	.40	.45	.50
Per foot		.09	.10	.12	.15	.18

**C-16885 Rubber Tubing**—Red or antimony, very best quality.

	No.	A	B	C	D
Diameter, inside, mm		3	4	5	6
Per foot		.04	.05	.08	.10
	No.	E	F	G	
Diameter, inside, mm		8	9	12	
Per foot		.18	.24	.28	

**C-16890 Rubber Tubing**—Red or antimony, same as No. C-16885 above, but heavy wall.

	No.	A	B	C	D	E
Diam, inside, mm		3	4	5	6	8
Per foot		.05	.07	.11	.12	.18
	No.	F	G	H	I	
Diam, inside, mm		9	12	15	18	
Per foot		.32	.34	.48	.65	

**C-16895 Rubber Tubing**—Cloth Impression—Extra quality, very flexible; will not split, air-tight and suitable for gas or liquid, hand-made.

	No.	A	B	C	D
Diameter, inside, mm		3	4	5	6
Per foot		.03	.03	.05	.06
	No.	E	F	G	
Diameter, inside, mm		8	9	12	
Per foot		.09	.14	.19	

**C-16900 Rubber Tubing**—Cloth Impression—Same as No. C-16895 above, but double thickness.

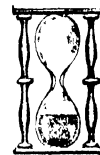
	No.	A	B	C	D	E
Diam, inside, mm		3	4	5	6	8
Per foot		.05	.05	.07	.14	.15
	No.	F	G	H	I	
Diam, inside, mm		9	12	15	18	
Per foot		.17	.24	.26	.35	

**C-16905 Rubber Tubing**—Pressure—For use with filter pumps, etc.

	No.	A	B	C	D
Diameter, inside, mm		3	4	5	6
Per foot		.07	.10	.25	.27
	No.	E	F	G	
Diameter, inside, mm		8	9	12	
Per foot		.35	.45	.50	



C-16925



C-16940

**C-16920 Sand Baths**—Deep form, of sheet steel.

	No.	A	B	C	D
Diameter, mm		50	75	100	125
Each		.08	.09	.11	.20
	No.	E	F	G	H
Diameter, mm		150	175	200	250
Each		.24	.35	.50	1.05

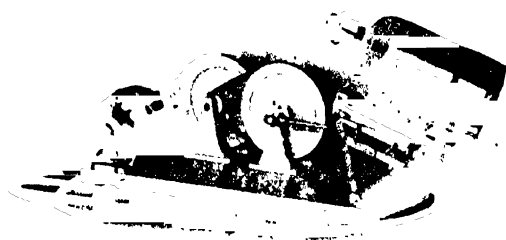
**C-16925 Sand Baths**—Shallow form, of sheet steel.

	No.	A	B	C	D
Diameter, mm		50	75	100	125
Each		.08	.09	.11	.16

Prices subject to change without notice

Continued on Next Page

		No.	E	F	G	H
Diameter, mm		150	175	200	250	
Each		19	.28	.35	70	
<b>C-16940 Sand Glasses, in polished wooden stands</b>						
	No.	C	D	E	F	G
Time, minutes	1	2	3	5	10	
Each	1.00	1.00	1.20	1.50	1.75	
<b>C-610 Sand Paper</b> In sheets 9" x 11" and in fine, medium, or coarse grades. Please specify grade desired.						
Per dozen sheets						25



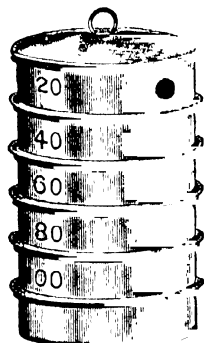
C-615

**C-615 Shaking Machine—Will**—An apparatus of new design accommodating accessories by which a 250 cc. Erlenmeyer flask, one bottle up to 500 cc. capacity or four test tubes of various sizes may be thoroughly shaken. Operated by a 1/20 H.P. 110 volt universal motor with rheostat control regulating oscillations of table from 240 to 360 per minute, speed reduction by grooved pulleys set very closely together, with eccentric actuating the shaking platform, mounted rigidly on cast-iron base, white enameled, 6 feet of cord and plug. Complete with accessories.

Net 85.00

**C-617 Shaking Machine—Will**—Same as above, but with 220 volt universal motor.

Price on application



C-625-35

**C-625 Sieves—Brass Frame**—Seamless brass gauze, very well made, diameter, 5 in.

	No.	A	B	C	D
Mesh	20	40	60	80	
Sieve only, each	1.70	1.70	2.10	2.20	
	No.	E	F	G	H
Mesh	100	120	150	200	
Sieve only, each	2.30	2.55	3.15	4.75	

**C-628 Cover**—For above  
Each .85

**C-630 Bottom**—For above  
Each .70

**C-635 Sieves** same as No. C-625 above, but of 8 in. diameter

	No.	A	B	C	D
Mesh	20	40	60	80	
Sieve only, each	2.80	3.00	3.15	3.25	

Prices subject to change without notice

	No.	E	F	G	H
Mesh	100	120	150	200	
Sieve only, etc.	3.40	4.35	5.70	8.10	
<b>C-638 Cover</b> For above					
Each					1.05
<b>C-640 Bottom</b> For above					
Each					.85



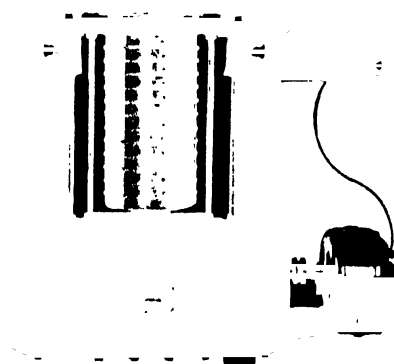
C-645

**C-645 Sieves—Standard Testing** With brass frame and gauze in accordance with the specification of the American Society for Testing Materials, diameter 8 inches.

	No.	A	B	C	D	E
Mesh	10	20	30	40	50	
Sieve only, each	Net 4.05	4.05	4.05	4.05	4.75	
	No.	F	G	H	I	J
Mesh	60	70	80	90	100	
Sieve only, each	Net 4.75	4.95	5.40	5.80	6.25	
	No.	K	L	M	N	P
Mesh	110	120	130	140	150	
Sieve only, each	Net 6.45	6.70	7.20	7.55	8.10	
	No.	Q	R	S	T	V
Mesh	160	170	180	190	200	
Sieve only, each	Net 8.40	9.30	10.15	10.70	11.00	

**C-648 Cover** For above  
Each Net 3.00

**C-650 Bottom** For above  
Each Net 3.00



C-556

**C-556 Sieve Shaking Apparatus—"Ro-Tap"**—Reproduces absolutely the circular and tapping motion given testing sieves in hand-sieving but with a uniform mechanical action producing dependable sizing tests, makes possible the standardization of processes and the obtaining of correct data for the plotting of graphical screen analyses. From 1 to 13 sieves can be shaken in one operation. Operated by 1/6 horse power motor, running parts operating in oil and no foundation being required. The "Stop-Rite" time switch eliminates errors in timing and makes operation of machine practically automatic. For 110 V. A.C. or D.C. Without time switch.

Each Net 360.00

(Please specify current when ordering.)

**C-557 "Stop-Rite" Time Switch** for above  
Each Net 33.00

Continued on Next Page

**C-560 Sleeves**—Of rubberized material, for use in laboratory  
Per pair . . . . . 1.00



C-16980



C-16985



C-5880



C-5890

**C-16980 Spatulas—Horn**—Best quality, with spatula on each end

	No.	A	B
Length, mm	100	125	
Each	16	.19	
	No.	C	D
Length, mm	150	200	
Each	20	.42	

**C-16985 Spatulas—Nickel**—Solid, with spatula on each end, length 180 mm  
Each . . . . . .75

**C-5880 Spatulas**—Coors porcelain, glazed throughout, spatula both ends

	No.	1	2	3
Length, mm	105	130	150	
Each	Net	.30	.42	.50
	No.	4	5	5a
Length, mm	195	212	225	
Each	Net	.66	.86	1.02
	No.	6	7	
Length, mm	280	348		
Each	Net	1.48	1.87	

**C-5890 Spatulas**—Coors porcelain, spoon on one end, spatula on other

	No.	1	1a	2	3
Length, mm	96	120	140	160	
Each	Net	.25	.32	.46	.60
	No.	4	4a	5	6
Length, mm	190	203	247	490	
Each	Net	.72	.90	1.02	3.30



C-16995



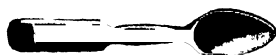
C-16990

**C-16990 Spatulas—Steel**—Flexible steel blade with steel handle, nickel-plated

	No.	A	B	C	D
Length of blade, mm	75	100	125	150	
Each	.65	.70	.80	.85	
	No.	E	F	G	
Length of blade, mm	200	250	300		
Each	1.20	2.10	3.55		

**C-16995 Spatulas—Steel**—So-called palette knife, flexible steel blade, with wooden handle

	No.	A	B	C	D
Length of blade, mm	75	100	125	150	
Each	.45	.48	.50	.60	
	No.	E	F	G	H
Length of blade, mm	175	200	250	300	
Each	.75	.95	1.50	2.50	



C-17005

Prices subject to change without notice

**C-17000 Spoons—Bone**—Best quality, length, 80 mm  
Each . . . . . .25

**C-17005 Spoons—Bone**—With spatula end

	No.	A	B
Length, mm	150	170	
Each	.30	.35	

**C-580 Spoons—Deflagrating**—Of heavy iron

	No.	A	B
Diameter of spoons, in	1/2	3/4	
Each	.13	.14	

**C-585 Spoons—Deflagrating**—Of heavy brass

	No.	A	B
Diameter of spoons, in	1/2	3/4	
Each	.18	.21	

**C-4925 Spoons—Glass**—Of heavy pressed glass

	No.	A	B	C
Size	Teaspoon	Dessertspoon	Tablespoon	
Each	.50	.80	1.40	

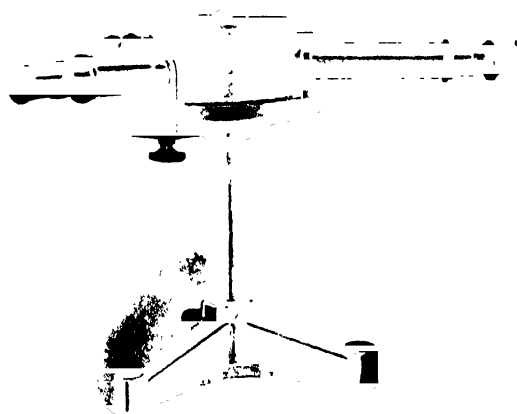
**C-17010 Spoons—Horn**—Best quality

	No.	B	C	D	F	G	J
Length, mm	100	120	150	200	220	300	
Each	.15	.17	.25	.38	.46	1.35	

**C-17015 Spoons—Horn**—With spatula end

	No.	B	C	D	F	J
Length, mm	100	120	150	200	300	
Each	.21	.25	.30	.46	1.45	

**C-17020 Spoons—Pure Nickel**—With spatula end, length, 180 mm  
Each . . . . . .75



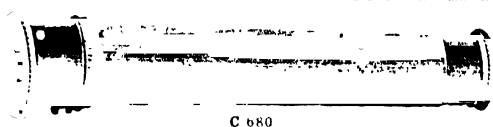
C-665

**C-665 Spectroscope**—The collimator and the telescope objectives are of 25 mm aperture and about 160 mm focal length. The lenses are achromatic and of the best quality. The prism is mounted on a prism table which is accurately adjusted for the prism provided and has three leveling screws. The slit is of adjustable width and 10 mm length. The telescope rotates about the axis of the instrument by means of a tangent screw, over a sufficient angle to permit ready observation of the entire spectrum. It is provided with simple draw tube for focusing. The scale tube is mounted at the proper angle to secure full reflection from the face of the prism. The tube with its mount can be rotated about the axis of the instrument to bring the scale image to the proper position, by loosening a screw underneath, which passes through a slot in the frame. The scale is a photographic negative having 16 figured divisions, each divided to tenths. The visible spectrum covers about ten divisions equal to about 40 degrees.

Each . . . . . Net 82.50

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- C-675 Spectroscope, Direct-vision** This instrument is provided with prism showing the principal Fraunhofer lines, and with adjustments whereby it can be focused for different eyesights. The slit is protected by means of a glass plate, thus preventing dust from lodging on it. With nickel tube mounted on polished wooden support.
- Each . . . . . 18 00
- C-680 Spectroscope** only, same as No. C-675, but without support, in box.
- Each . . . . . 18 00
- C-685 Spectroscope** Same as No. C-675, with attachment for holding tube for absorption spectral experiments.
- Each . . . . . 20 00
- C-690 Spectroscope, Direct-vision** With five prisms, achromatic lenses, and adjustable slit. Will show many of the Fraunhofer lines, the bright lines of metals and gases, and the absorption bands in colored glass crystals or liquids. Length, 75 mm.; diameter, 18 mm. Complete in morocco case.
- Each . . . . . 22 50
- C-695 Spectroscope** Same as No. C-690, with comparison prism.
- Each . . . . . 30 00

## STILLS, WATER

**Stills, Water, Barnstead** Stills of this manufacture include four types, viz.: Laboratory, Commercial, Druggists and Home Types. The stills are constructed on the regenerative principle, water being preheated before entering the still, and are continuous and automatic in operation. The construction is of cold-rolled copper, tin-lined, condensers consisting of tinned copper and tinned brass tubes. These stills may be had in capacities from one quart to one hundred gallons per hour. Heating is accomplished by steam, gas, electrical unit or kerosene.

### C-17465 Laboratory Type—Gas Operated.

Capacity, gals., per hour	1	1½	2	5	10
Shipping weight, lb.	70	75	85	100	410
Each	Net 60 50	75 00	96 80	165 00	330 00



Prices subject to change without notice

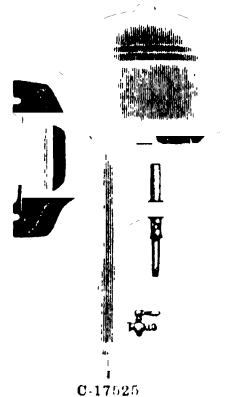
### C-17470 Laboratory Type—Electrically Operated.

Capacity, gals., per hour	1	1½	2	5	10
Consumption in K. W. per hour	24	4	6	12	24
Shipping weight, lb.	65	75	85	100	400
Each	Net 75 90	96 80	121 00	297 00	580 00

### C-17475 Commercial Steam Type.

Capacity, gals., per hour	1	2	5	7	10	15	20
Shipping weight, lb.	70	75	85	150	300		
Each	Net 72 60	104 50	154 00	220 00	330 00		
Capacity, gals., per hour	20	25	25	30	50	75	100
Shipping weight, lb.	450	600	750	1260	1400		
Each	Net 412 50	522 50	700 00	900 00	1200 00		

**Stills, Water, Stokes'** These stills are of the wall type, are regenerative in principle and automatic in operation. The condenser, cylinder and boiling chamber and other parts with which the raw water comes into contact are made of cast-iron, the condenser tubes and all portions with which the distillate comes in contact are of tin-lined brass. The exterior of the gas-heated stills is finished with aluminum paint and the covers are porcelain lined. The larger sizes are painted blue gray and have tin-lined copper covers. These stills may be had in capacities from one-half to two and three-quarter gallons per hour when heated by gas, steam operated stills may be obtained in sizes from one to one hundred gallons per hour. Kerosene heated stills are manufactured in a one-half gallon per hour size only.



### C-17525 Gas Operated (With adjustable burner for the use of any fuel gas)

	No.	A	B	C
Capacity, gal., per hour	1½	3¼	2¾	
Shipping weight, lb.	70	200	200	
Each	Net 25 00	27 00	60 00	

### C-17530 Steam Operated

	No.	A	B	C	D
Capacity, gal., per hour	¾	2¾	5	10	
Shipping weight, lb.	70	200	350	425	
Each	Net 30 00	75 00	150 00	200 00	

	No.	E	F	G
Capacity, gal., per hour	25	60	100	
Shipping weight, lb.	875	1425	1750	
Each	Net 300 00	500 00	750 00	

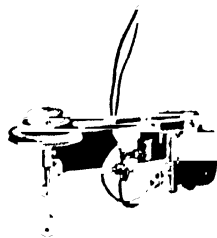
### C-17531 Gas and Steam Operated.

	No.	A
Capacity, gal., per hour	1	
Shipping weight, lb.	70	
Each	Net 31 00	

### C-17535 Gasoline Operated.

	No.	A	B
Capacity, gal., per hour	½	1½	
Shipping weight, lb.	70	70	
Each	Net 37 50	37 50	

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C 17540

**C-17540 Stirring Apparatus** Has electric motor, adjustable bracket, spindle with chuck for holding stirrer blades and three-step pulley; furnished complete with rheostat for controlling speed, for alternating current

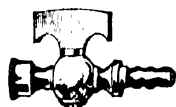
	No.	A	B
Voltage	110	220	
Each	Net 37.50	41.25	

**C-17545 Stirring Apparatus** Same as No. C-17540 above, but for direct current

	No.	A	B
Voltage	110	220	
Each	Net 37.50	41.25	



C 17550



C-17565

**C-17550 Stopcocks—Brass**—One end with male screw, other with female screw.

	No.	A	B
Bore, mm	3	6	
Each	1.00	1.45	

**C-17565 Stopcocks—Brass**—One end for tubing, other with male screw.

	No.	A	B
Bore, mm	3	6	
Each	1.00	1.45	



C 17570



C 17575

**C-17570 Stopcocks—Brass** One end for tubing, other with female screw

	No.	A	B
Bore, mm	3	6	
Each	1.00	1.45	

**C-17575 Stopcocks—Brass** Air and gas tight, both ends for tubing

	No.	A	B
Bore, mm	3	6	
Each	1.00	1.45	



C-4930



C-4935

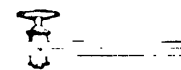
**C-4930 Stopcocks—Glass—Geissler's**—With curved outlet

	No.	A	B	C	D	F
Diam of bore, mm	1	2	3	4	6	
Each	.60	.65	.80	.90	1.35	

Prices subject to change without notice

**C-4935 Stopcocks—Glass—Geissler's**—Straight

	No.	A	B	C	D	F
Diam of bore, mm	1	2	3	4	6	
Each	.60	.65	.80	.90	1.35	



C 4940

**C-4940 Stopcocks—Glass—Geissler's**—Straight, with inlet and outlet of capillary tubing, from 6 to 7 mm outside diameter

	No.	A	B
Diameter of bore, mm	1	2	
Each	.65	.70	



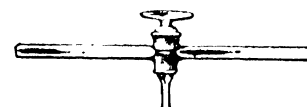
C-4950

**C-4945 Stopcocks—Glass—Geissler's Latest Form**—Two-way, with plug bored at an angle, absolutely air-tight and will not leak

	No.	A	B
Diameter of bore, mm	2	4	
Each	.80	1.10	

**C-4950 Stopcocks—Glass—Geissler's Latest Form**—Same as No. C-4945 above, but with capillary tubing; diameter of bore, 2 mm

	No.	A	B
Each	1.00		



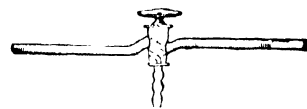
C-4955

**C-4955 Stopcocks—Glass—Geissler's**—Three-way; with downward outlet at end of stopper for rubber connection

	No.	A	B	C
Diameter of bore, mm	1	2	4	
Each	.80	.90	1.35	

**C-4960 Stopcocks—Glass—Geissler's**—Same as No. C-4955 above, but with capillary tubing

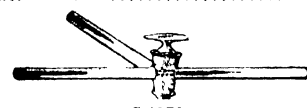
	No.	A	B
Diameter of bore, mm	1	2	
Each	1.35	1.40	



C-4965

**C-4965 Stopcocks—Glass**—Three-way, with oblique bore, with downward outlet at end of stopper for rubber connection

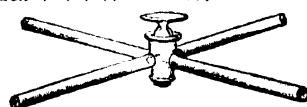
	No.	A	B
Diameter of bore, mm	2	4	
Each	1.00	1.60	



C-4970

**C-4970 Stopcocks—Glass—Geissler's**—Three-way.

	No.	A	B	C
Diameter of bore, mm	2	3	4	
Each	.80	.90	1.00	



C-4980

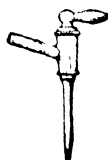
**C-4980 Stopcocks—Glass—Geissler's**—Four-way.

	No.	A	B	C
Diameter of bore, mm	2	3	4	
Each	1.15	1.35	1.60	

Continued on Next Page



C-4985



C-5020

**C-4985 Stopcocks—Glass**—Three-way, with stopper having two oblique bores, and with two outlets on one side

	No.	A	B
Diameter of bore, mm	2	4	
Each	1.15	1.95	

**C-4990 Stopcocks—Glass**—Same as No. C-4985 above, but with capillary tubing, with 2 mm bore each

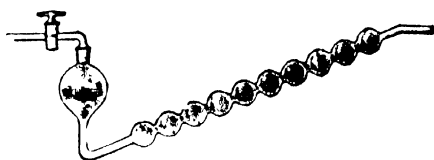
Each	1.30		
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**C-5015—Stopcocks—Glass**—Straight, of light weight for making burette tips, etc., with drawn-out tip

	No.	A	B	C
Diameter of bore, mm	1	2	3	
Each	.65	.70	.80	

**C-5020 Stopcocks—Glass—Fresenius'**—Angle form, for burette tips, etc., with drawn-out tip

	No.	A	B
Diameter of bore, mm	1	2	
Each	.75	.80	



C-5060

**C-5060 Sulfur Apparatus—Meyer's**—For the determination of carbon in iron and steel by the use of barium hydrate, and the determination of sulfur by the aid of bromine, without stopcock, with 10 bulbs

Each	1.80		
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**C-5065 Sulfur Apparatus—Meyer's**—Same as No. C-5060 above, but with stopcock, with 10 bulbs

Each	3.00		
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## SUPPORTS

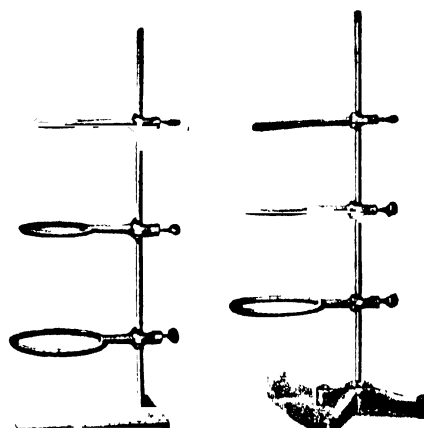
**C-17600 Supports—Apparatus**—Rectangular base, with screw threads of ample size, well cut and fitted

	No.	A	B
Size	Small	Medium	
Size of base, mm	100 x 150	125 x 200	
Length of rod, mm	450	500	
Each	.40	.60	
	No.	C	D
Size	Large	Extra Large	
Size of base, mm	130 x 225	150 x 275	
Length of rod, mm	650	900	
Each	1.10	1.50	

**C-17605 Supports—Apparatus**—Rectangular base, same as No. C-17600, with rings

	No.	A	B
Size	Small	Medium	
Number of rings	2	3	
Each	.90	1.35	
	No.	C	D
Size	Large	Extra Large	
Number of rings	4	4	
Each	2.25	2.65	

Prices subject to change without notice



C-17605

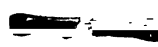
C-17616

**C-17610 Supports—Apparatus**—Tripod base

	No.	A	B
Size	Small	Medium	
Length of rod, mm	450	500	
Each	.40	.60	
	No.	C	D
Size	Large	Extra Large	
Length of rod, mm	650	900	
Each	1.10	1.50	

**C-17615 Supports—Apparatus**—Tripod base, same as No. C-17610, with rings

	No.	A	B
Size	Small	Medium	
Number of rings	2	3	
Each	.90	1.35	
	No.	C	D
Size	Large	Extra Large	
Number of rings	4	4	
Each	2.25	2.65	



C-17650

**C-17650 Supports—Burette**—Of wood, clamp cork lined, for two burettes

Each	2.70		
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**C-17655 Supports—Burette**—With double arm to keep burettes steady

Each	3.15		
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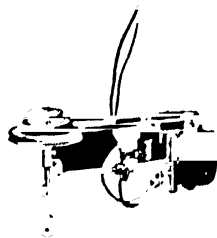
**C-17665 Supports—Burette, Chaddock's**—With square milk glass plate, set in wooden base, for one burette.

Each	3.75		
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**C-17670 Supports—Burette, Chaddock's**—With square milk glass plate, set in wooden base, for two burettes

Each	4.00		
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C 17540

**C-17540 Stirring Apparatus** Has electric motor, adjustable bracket, spindle with chuck for holding stirrer blades and three-step pulley; furnished complete with rheostat for controlling speed, for alternating current

	No.	A	B
Voltage	110	220	
Each	Net 37.50	41.25	

**C-17545 Stirring Apparatus** Same as No. C-17540 above, but for direct current

	No.	A	B
Voltage	110	220	
Each	Net 37.50	41.25	



C 17550



C-17565

**C-17550 Stopcocks—Brass**—One end with male screw, other with female screw.

	No.	A	B
Bore, mm	3	6	
Each	1.00	1.45	

**C-17565 Stopcocks—Brass**—One end for tubing, other with male screw.

	No.	A	B
Bore, mm	3	6	
Each	1.00	1.45	



C 17570



C 17575

**C-17570 Stopcocks—Brass** One end for tubing, other with female screw

	No.	A	B
Bore, mm	3	6	
Each	1.00	1.45	

**C-17575 Stopcocks—Brass** Air and gas tight, both ends for tubing

	No.	A	B
Bore, mm	3	6	
Each	1.00	1.45	



C-4930



C-4935

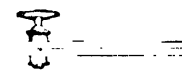
**C-4930 Stopcocks—Glass—Geissler's**—With curved outlet

	No.	A	B	C	D	F
Diam of bore, mm	1	2	3	4	6	
Each	.60	.65	.80	.90	1.35	

Prices subject to change without notice

**C-4935 Stopcocks—Glass—Geissler's**—Straight

	No.	A	B	C	D	F
Diam of bore, mm	1	2	3	4	6	
Each	.60	.65	.80	.90	1.35	



C 4940

**C-4940 Stopcocks—Glass—Geissler's**—Straight, with inlet and outlet of capillary tubing, from 6 to 7 mm outside diameter

	No.	A	B
Diameter of bore, mm	1	2	
Each	.65	.70	



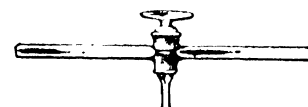
C-4950

**C-4945 Stopcocks—Glass—Geissler's Latest Form**—Two-way, with plug bored at an angle, absolutely air-tight and will not leak

	No.	A	B
Diameter of bore, mm	2	4	
Each	.80	1.10	

**C-4950 Stopcocks—Glass—Geissler's Latest Form**—Same as No. C-4945 above, but with capillary tubing; diameter of bore, 2 mm

	No.	A	B
Each	1.00		



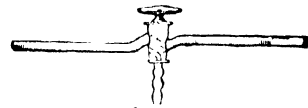
C-4955

**C-4955 Stopcocks—Glass—Geissler's**—Three-way; with downward outlet at end of stopper for rubber connection

	No.	A	B	C
Diameter of bore, mm	1	2	4	
Each	.80	.90	1.35	

**C-4960 Stopcocks—Glass—Geissler's**—Same as No. C-4955 above, but with capillary tubing

	No.	A	B
Diameter of bore, mm	1	2	
Each	1.35	1.40	



C-4965

**C-4965 Stopcocks—Glass**—Three-way, with oblique bore, with downward outlet at end of stopper for rubber connection

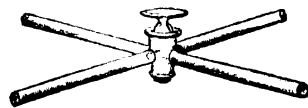
	No.	A	B
Diameter of bore, mm	2	4	
Each	1.00	1.60	



C-4970

**C-4970 Stopcocks—Glass—Geissler's**—Three-way.

	No.	A	B	C
Diameter of bore, mm	2	3	4	
Each	.80	.90	1.00	



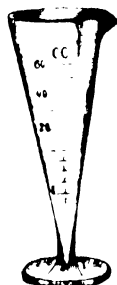
C-4980

**C-4980 Stopcocks—Glass—Geissler's**—Four-way.

	No.	A	B	C
Diameter of bore, mm	2	3	4	
Each	1.15	1.35	1.60	

Continued on Next Page

<b>C-18033 Test Paper</b> —Congo red, in sheets, 250 x 200 mm	
Per quire	60
Per sheet	04
<b>C-18036 Test Paper</b> —Fumicel, in sheets, 270 x 200 mm	
Per quire	75
Per sheet	07
<b>C-18039 Test Paper</b> —Lacmoid, in sheets, 250 x 200 mm	
Per quire	75
Per sheet	07



C-5095

**C-5090 Test Glasses**—For collecting sediments, of best, resistance glass, conical form, with foot and pour-out

No.	A	B	C	D	E	F
Capacity, cc	30	60	125	200	250	500
Each	.38	.45	.54	.68	.83	.98

**C-5095 Test Glasses**—Same as No. C-5090 above, but graduated in the metric system

No.	A	B	C	D	E	F
Capacity, cc	30	60	125	200	250	500
Each	.53	.70	.90	1.05	1.20	1.35



C-5110



C-5105

**C-5105 Test Tubes**—With lip, thin wall, even thickness; of best selected quality, free from bubbles and striae, well annealed, wrapped separately in paper

No.	6	7	14	16	21	22
Length, mm	75	75	100	100	120	120
Diameter, mm	9	11	12	16	13	16
Per gross	1.75	1.90	1.95	2.70	2.55	3.00
No.	23	28	29	30	31	33
Length, mm	120	150	150	150	150	150
Diameter, mm	18	12	16	18	20	25
Per gross	3.15	2.80	3.25	3.65	4.85	6.40
No.	35	37	40	41		
Length, mm	180	180	200	200		
Diameter, mm	18	22	20	25		
Per gross	4.10	5.60	5.25	6.75		

**C-5107 Test Tubes—Pyrex**—With lip, light wall

No.	A	B	C	D	E
Height, mm	75	100	125	150	150
Diameter, mm	10	12	15	16	18
No. in orig. carton	200	200	100	150	150
Each	.06	.07	.09	.11	.12

Prices subject to change without notice

No.	F	G	H	I	J
Height, mm	175	100	150	200	250
Diameter, mm	22	25	25	25	25
No. in orig. carton	100	100	75	50	100
Each	.13	.15	.17	.25	.36
No.	K	L	M	N	O
Height, mm	300	200	300	300	300
Diameter, mm	25	29	29	32	32
No. in orig. carton	75	75	50	75	25
Each	.40	.40	.45	.48	.54
No.	P	Q	R	S	
Height, mm	200	300	400	500	
Diameter, mm	38	38	50	65	
No. in orig. carton	25	25	1	1	
Each	.56	.72	1.25	1.78	

If ordered in original carton, less 10% discount

**C-5110 Test Tubes**—Without lip, heavy wall, round bottom, of same quality as No. C-5105 above

No.	1	5	9	10	11
Length, mm	50	75	100	100	100
Diameter, mm	8	11	10	12	15
Per gross	1.55	1.95	2.05	2.10	2.42
No.	15	16	17	23	25
Length, mm	120	120	120	150	150
Diameter, mm	12	16	18	12	16
Per gross	2.55	3.00	3.15	2.80	3.15
No.	26	27	31	33	
Length, mm	150	150	180	200	
Diameter, mm	18	20	22	25	
Per gross	3.60	4.00	5.60	7.15	

**C-5112 Test Tubes—Pyrex**—Without lip, light wall

No.	A	B	C	D	E
Height, mm	75	100	125	150	150
Diameter, mm	10	12	15	16	18
No. in orig. carton	200	200	100	150	150
Each	.05	.06	.08	.10	.11
No.	F	G	H	I	J
Height, mm	175	100	150	200	250
Diameter, mm	22	25	25	25	25
No. in orig. carton	100	100	75	50	100
Each	.12	.14	.16	.24	.34
No.	K	L	M	N	O
Height, mm	300	200	300	300	300
Diameter, mm	25	29	29	32	32
No. in orig. carton	75	75	50	75	25
Each	.38	.38	.43	.44	.50
No.	P	Q	R	S	
Height, mm	200	300	400	500	
Diameter, mm	38	38	50	65	
No. in orig. carton	25	25	1	1	
Each	.52	.68	1.19	1.67	

If ordered in original carton, less 10% discount

**C-5113 Test Tubes—Pyrex**—Without lip, heavy wall, so-called "Ignition Tubes"

No.	A	B	C	D	E
Height, mm	70	100	125	150	200
Diameter, mm	10	14	16	20	25
No. in orig. carton	200	150	100	100	50
Each	.08	.11	.13	.22	.34

If ordered in original carton, less 10% discount

**C-5120 Test Tubes**—With foot and lip, of same quality as No. C-5105.

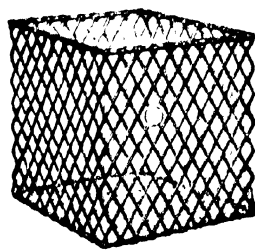
No.	A	B	C	E	F
Length, mm	100	125	150	200	250
Diameter, mm	13	16	18	25	25
Each	.07	.13	.17	.29	.42

**C-6180 Test Tubes—Vitreosil**—With heavy walls and flared tops, withstand high temperatures and can be cooled rapidly without breakage

No.	A	B	C	D	E	F
Length inside, mm	102	127	127	152	152	178
Diam. inside, mm	12-13	12-13	15-16	15-16	19	22
Each	.50	.65	.70	.80	.85	1.15

Other types and sizes made promptly to order.

Continued on Next Page



C-18080

**C-18080 Test Tube Baskets** Made of smooth tinned wire with very few joints for use in incubators and sterilizers

	No. A	B	C	D
Height, mm	150	150	100	150
Length, mm	150	125	125	
Width, mm	150	100	100	
Diameter, mm				125
Each	.85	.50	.45	.55

## THERMOMETERS

**C-5140 Thermometers—Ordinary quality** With Centigrade scale etched on stem and white background. Each thermometer is enclosed in pasteboard box

No.	B	D	F	H	J	L
Graduated to	100°	150°	200°	250°	300°	350° C
Each	1.00	1.10	1.20	1.30	1.40	1.55

**C-5145 Thermometers—Ordinary quality** Same as above, but with Fahrenheit scale etched on stem, and white background. Those over 400° F are nitrogen-filled. Each thermometer is enclosed in pasteboard box

No.	B	D	F	H	J	L
Graduated to	220°	300°	400°	500°	600°	700° F
Each	1.00	1.10	1.20	1.30	1.40	1.55

**C-5150 Thermometers—Ordinary quality** Same as above, but with Centigrade and Fahrenheit scales, etched on stem, and white background. Those over 200° C and 400° F are nitrogen-filled. Each thermometer is enclosed in pasteboard box

No.	A	C	E	G	I	K
Graduated to	100°	150°	200°	250°	300°	350° C
Graduated to	220°	300°	400°	500°	600°	700° F
Each	1.40	1.50	1.70	1.75	1.80	1.95

**C-5156 Thermometers—Standard quality** With Centigrade scale etched on stem and white background. Those over 200° C are nitrogen-filled. With factory certificate of accuracy

No.	B	D	E
Graduated to	-20° to 50°	0° to 105°	0° to 150° C
Subdivided in	1/5°	1/10°	1/10°
Length, mm	300	600	675
Each	6.50	14.50	16.50

No.	F	G
Graduated to	0° to 200°	0° to 250° C
Subdivided in	1/5°	1/5°
Length, mm	600	750
Each	15.20	18.50

**C-5197 Thermometers—Paper Scale** Graduated to single degrees Centigrade. Diameter 3/8 inches, length about 12 inches

No.	A	B	C
Graduated to	100°	150°	250° C
Each	.75	.80	.90

Prices subject to change without notice

**C-5207 Thermometers—Paper Scale** Similar to No. C-5197, but with Fahrenheit graduations

	No. A	B	C	D
Graduated to	212°	300°	400°	600° F
Each	.75	.80	.90	1.10

**C-5222 Thermometers—Paper Scale** Similar to No. C-5197, but with both Centigrade and Fahrenheit graduations

	No. A	B	C	D
Graduated to	100°	150°	200°	300° C
Graduated to	212°	300°	400°	600° F
Each	.85	1.00	1.20	1.40

**C-5289 Thermometers** With enclosed milk-glass, double scale reading in Centigrade and Fahrenheit.

	No. A	B	C	D
Graduated to	100°	150°	200°	300° C
Graduated to	212°	300°	400°	600° F
Each	2.00	2.20	2.50	2.75

We are prepared to furnish special shapes and ranges in mercurial thermometers as well as all kinds of optical and electrical pyrometers.



C-18145

**C-18145 Tongs—Crucible**—Brass, polished, single bent

	No. A	C
Length, mm	225	300
Each	.50	.80

**C-18148 Tongs—Crucible**—Same style as No. C-18145 above; nickel-plated

	No. A	C
Length, mm	225	300
Each	.70	1.30



C-18151

**C-18151 Tongs—Crucible** Brass, polished, double bent. Same sizes and prices as No. C-18145 above

**C-18153 Tongs—Crucible**—Same style as No. C-18151 above; nickel-plated. Same sizes and prices as No. C-18148 above



C-18165

**C-18155 Tongs—Crucible**—Of forged steel, nickel-plated; single bent

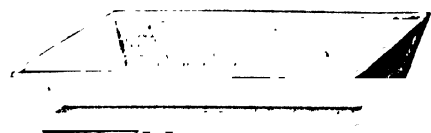
	No. A	B
Length, mm	225	300
Each	.60	.85

**C-18160 Tongs—Crucible**—Of forged steel, nickel-plated; double bent. Same sizes and prices as No. C-18155 above

**C-18165 Tongs—Crucible**—Of nickel-chromium alloy; double bent, length, 225 mm

Each	Net	3.75
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C-5345

**C-5345 Trays—Photographic**—Of white, pressed glass, for developing photographs and other purposes

	No.	A	B	C	D	E
Length, in	5 $\frac{1}{2}$	6	8 $\frac{1}{2}$	9	10 $\frac{1}{2}$	
Width, in	4	4	5 $\frac{1}{2}$	7	8	
Each	30	.30	.45	.65	.90	

**C-5350 Trays—Photographic**—Of colored glass, for developing photographs and other purposes

	No.	A	B	C	D	E
Length, in	5 $\frac{1}{2}$	6	8 $\frac{1}{2}$	9	10 $\frac{1}{2}$	
Width, in	4	4	5 $\frac{1}{2}$	7	8	
Each	.30	.30	.45	.65	.90	



C-18215

C-18225

C-18220

**C-18215 Triangles**—Twisted iron wire

	No.	A	B	C
Size		Small	Medium	Large
Each		.06	.06	.06
Per dozen		.60	.60	.60

**C-18220 Triangles**—Iron wire, covered with pipe-stem.

	No.	A	B	C
Size		Small	Medium	Large
Each		10	10	10
Per dozen		1.05	1.05	1.05

**C-18225 Triangles**—Iron wire, covered with pipe-stem, flanged so that the vessel rests on three points only, thus increasing the heating surface, saving time and gas

	No.	A	B	C
Size		Small	Medium	Large
Each		.12	.12	.12
Per dozen		1.20	1.20	1.20

**C-18235 Triangles**—"Nichrome"—Made from original alloy of nickel and chromium, are very hard, tough, and resist oxidation and attack of fumes, may be used wherever platinum triangles are suitable

	No.	A	B	C	D
Length of side, mm	40	50	65	75	
Diam inscribed circle, mm	22	29	36.5	44.5	
Each	12	.12	.15	.15	

**C-18240 Triangles**—"Chromel"—Of square wire, with twisted ends

	No.	A	B	C	D
Length of sides, in	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3	
Diameter of inscribed circle, in	7/8	1 $\frac{1}{16}$	1 $\frac{1}{16}$	1 $\frac{1}{4}$	
Each	Net	.28	.28	.40	.40

**C-18245 Triangles**—"Chromel"—Of round wire, with twisted ends

	No.	A	B	C	D
Length of sides, in	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3	
Diameter of inscribed circle, in	7/8	1 $\frac{1}{16}$	1 $\frac{1}{16}$	1 $\frac{1}{4}$	
Each	Net	.18	.18	.25	.25

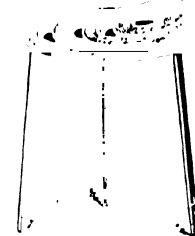
Prices subject to change without notice

**Triangles—"Vitreosil"**—Either solid or mounted on wire, withstand laboratory conditions indefinitely, outlast innumerable pipe-stem triangles, and can be used at higher temperatures with much less loss of heat on account of their smaller conductivity—no damage can result to platinum utensils supported by "Vitreosil" triangles—"Vitreosil" mounted "nichrome" triangles are especially recommended

	No.	A	B	C	D	E	F
Length of side, mm	38	44	51	57	63	70	
<b>C-6195</b> On iron wire, each	Net	.25	.25	.25	.33	.33	.42
<b>C-6196</b> On nickel wire, each	Net	.33	.33	.33	.42	.50	.58
<b>C-6197</b> On "nichrome" wire, each	Net	.50	.50	.50	.60	.70	.80
<b>C-6198</b> All silica, each	Net	1.50	1.50	1.50	1.75	1.75	2.00
	No.	G	H	I	J		
Length of side, mm	76	82	89	95			
<b>C-6195</b> On iron wire, each	Net	.42	.50	.50	.58		
<b>C-6196</b> On nickel wire, each	Net	.58	.67	.67	.75		
<b>C-6197</b> On "nichrome" wire, each	Net	.80	.90	.90	1.00		
<b>C-6198</b> All silica, each	Net	2.00	2.00	2.25	2.25		



C-18260



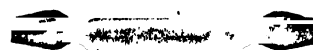
C-18265

**C-18260 Tripods**—Iron—For Bunsen burner, single ring

	No.	A	B	C	D
Diameter, mm	70	100	125	150	
Each		.40	.40	.40	.55
	No.	E	F	G	
Diameter, mm	200	250	300		
Each		.85	1.10	1.25	

**C-18265 Tripods**—Iron—For supporting water baths, sand baths, retorts, etc

	No.	A	B	C	D	E
Diameter, mm	125	150	200	250	300	
Number of rings	2	3	4	5	6	
Each	65	.95	1.25	1.70	2.10	



C-5365

**C-5365 Tubes—Connecting**—Straight, with both ends of same size

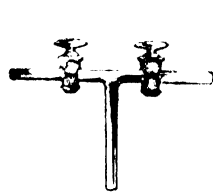
	No.	A	B	C
Length, mm	65	70	75	
Diameter, inside, mm	6	10	12	
Each	.05	.05	.05	

**C-5370 Tubes—Connecting**—Straight, with ends of different sizes—Same lengths, diameters and prices as No C-5365 above

Continued on Next Page



C-5375



C-5380



C-5390

**C-5375 Tubes—Connecting** Of glass, T-shape

No.	A	B	C	D	F
Diam., inside, mm	3	5	6	9	12
Each	.07	.08	.09	.11	.15

**C-5380 Tubes—Connecting** Of glass, T-shape, with two Grassler stopcocks, diameter, inside, 5 mm

Each	1.80
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**C-5390 Tubes—Connecting** Of glass, Y-shape

No.	A	B	C	D	F
Diam., inside, mm	3	5	6	9	12
Each	.08	.09	.10	.12	.16

**C-6210-15 Tubes—"Vitreoscil"—Unglazed** In lengths up to 10 feet. Satin surface, superior heat and chemical resisting properties and exceptional resistance to sudden changes of temperature render "Vitreoscil" tubes superior to glass, porcelain and platinum for use in combustion work, as pyrometer tubes, in electrical furnace construction, in gas reaction work, in flue gas analysis and as cooling elements, are supplied with ends fused smooth and to true circular shape, permitting gas tight closure with rubber stoppers, permit rapid heating, thus effecting a decided saving of time, and may be subjected to the highest temperatures in combustion work without danger of bending, largely employed in electric resistance furnaces for determination of carbon, oxygen and sulphur in iron, steel and other non-volatile metals, for determination of sulphur in pyrites cinder, and for determination of carbon, hydrogen, halogens and sulphur in organic compounds, admirably adapted for chemical operations involving reactions between gases at high temperature, or may be employed for reaction chambers in which the combination of gases evolving heat is brought about, can be supplied with extremely thin walls and form especially efficient units for the cooling and condensation of corrosive liquids and gases.

	No.	J	L	BB	C	D				
Bore, mm	6	7	9	10	12	13	17	18	19	
Wall thickness, mm	2	2.5	2	2.5	1	2	1	2.5	1	3
Per foot	Net	1.44	2.33	2.00	2.50	2.80				
Extra per tube for closed end	Net	.30	.35	.40	.65	.75				
	No.	E	F	G	I	JJ				
Bore, mm	22	25	28	29	35	38				
Wall thickness, mm	1	3	1	3	2	5	2	5		
Per foot	Net	3.05	3.35	3.55	4.00	4.20				
Extra per tube for closed end	Net	.75	.85							

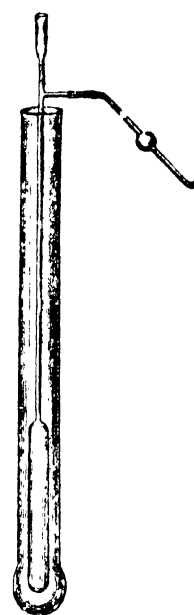
For length of less than 1 foot, add 10%.

Many other sizes of bore and thicknesses of wall can be supplied. Prices on request.

**C-18360 Tubing, Metal—Flexible**—Made of continuous strip of grooved metal wound spirally over itself between layers, is especially practical from standpoint of safety and durability, of steel

No.	B	C	D	DD
Diameter, mm	6	6	6	6
Length, mm	600	750	900	1800
Per length	.25	.30	.35	.60
No.	F	G	4H	I
Diameter, mm	8	8	8	8
Length, mm	600	750	900	1800
Per length	.30	.35	.40	.65

Prices subject to change without notice



C-5430

**C-5430 Vapor Density Apparatus—Victor Meyer's—Improved form complete**

Each	1.70
------	------

**Inner Tube—Only for C-5430.**

Each	.85
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**Outer Tube—Only for C-5430.**

Each	.85
------	-----

**Small Glass Stoppered Vials—Only for use with C-5430.**

Each	.27
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C-5435



C-5445



C-5450

**C-5435 Vials**—With flat bottom, slight neck and ground-in, air-tight stopper, so-called "Specimen" vials

No.	AA	A
Capacity, cc	2	4
Each	.12	.12

**C-5445 Vials**—Homeopathic, short form, with neck, flat bottom, and cork-lined metal screw-cap.

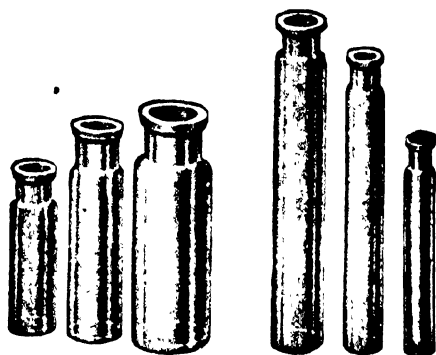
No.	A	B	C	D	E	G	I
Capacity, drams	1	2	3	4	8	12	
Per gross	2.45	2.80	3.20	4.15	6.75	8.85	

**C-5450 Vials—Tube Form**—So-called "Shell Vials", of clear, white glass, without constriction at neck, with flat bottom, without corks

No.	9	20	29	41
Height, mm	38	50	60	70
Diameter, mm	12	12	13	15
Per gross	1.10	1.10	1.20	1.45
No.	42	50	55	
Height, mm	70	75	80	
Diameter, mm	22	20	25	
Per gross	2.40	2.30	3.40	

Continued on Next Page





C-5460

C-5465

C-5460 Vials—Homeopathic, short form, with neck, flat bottom for cork stopper

No.	C	D	F	H	I	J
Capacity, drams		1	2	4	6	8
Per gross	1.15	1.15	1.35	2.70	3.60	4.50

C-5465 Vials—Homeopathic, long form, with neck, flat bottom for cork stopper

No.	C	D	F	H	I	J
Capacity, drams		1	2	4	6	8
Per gross	1.15	1.15	1.35	2.70	3.60	4.50



C-5470

C-5470 Watch Glasses—Of well-annealed glass, thin, concave, with edges smoothly ground

No.	C	D	E	F	G	H
Diameter, mm	40	50	65	75	85	100
Per ten	.40	.70	.80	.95	1.05	1.25

No.	I	J	L	N	O
Diameter, mm	115	125	150	175	200
Per ten	1.40	1.55	1.65	2.75	3.40

C-5475 Watch Glasses—In pairs, with edges accurately ground together, not to be confused with counterpoised watch glasses

No.	A	B
Diameter, mm	50	65
Per pair	.30	.35

C-5480 Watch Glasses—Balance—Counterpoised in pairs, accurately adjusted for interchangeable use on analytical balance pans

No.	B	BB	C
Diameter, mm	65	70	75
Per pair, Net	1.35	1.35	1.35



C-5490

Prices subject to change without notice

C-5490 Watch Glasses—Square form, consist of glass blocks, 40 mm square, with a concavity, one vertical surface ground for writing on, bottom of concavity fairly flat but with mold, or unpolished finish with cover

Per ten 1.00

C-5495 Watch Glasses—Square form—Same as No. C-5490 above, but with polished, spherical cavity

Per ten 4.25



C-5497

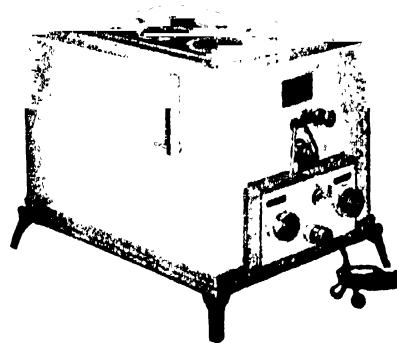
C-5497 Watch Glasses—Syracuse Solid—Improved form, most convenient for handling without danger from dropping and will withstand more hard usage without breaking or chipping than any other form; bottom surfaces are parallel, making it possible to examine objects in the glass without distortion, while the slight curvature around the inside of the bottom permits the easy use of the section filter; flange around the bottom permits the glasses to be stocked securely

Per ten 70

C-5498 Watch Glasses—Syracuse Solid—Same as No. C-5497 above, but with ground, beveled surface for writing on

Per ten .95

## WATER BATHS



C-18923

C-18922 Water Bath—Freas' Electric—Automatically controlled, consists of heavy copper tank with heavy asbestos outer covering, has working space 4 in. deep by 12 in. by 18 in., constant temperature regulator is the standard Freas bimetallic; without cover, constant temperature range is from room temperature up to about 65°C.

Each ..... Net 150.00  
(Please state voltage and current when ordering.)

C-18923 Water Bath—Freas' Electric—Similar to No. C-18922, but with cover, temperature range is from room temperature up to about the boiling-point of water

Each ..... Net 180.00

(Please state voltage and current when ordering.)

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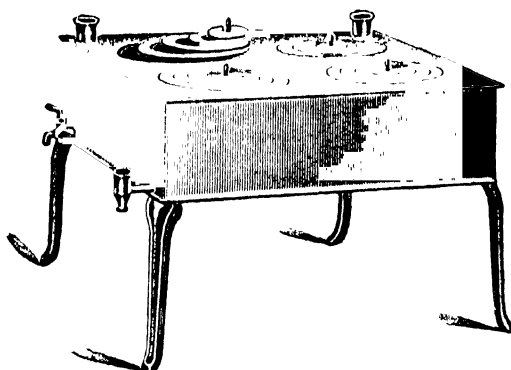


C 18930

**C-18930 Water Bath—Electric**—Constructed of heavy polished copper, tin lined and equipped with electric heating coil in water chamber, removable cover, provided with tubulation for thermometer, contains two sets (the large bath, four sets) of concentric rings, affording openings with range from 2.5 to 15 cm., removable copper tray rests inside of bath, supported by brackets, fitted with constant water level and brass faucet for drawing off water, supported on sheet iron base 15 cm. high, furnished complete, ready to attach to a lamp socket.

	No.	A	B
Height, cm.		13	13
Width, cm.		38	38
Depth, cm.		38	20
Each		Net 72.00	45.00

(Please state voltage and current when ordering.)



C 18955

**C-18945 Water Bath**—Made of highly polished copper, tin lined, provided with brass stopcock, constant water level attachment, extra sheet iron bottom, and four detachable legs, has seven openings, of which three are 150 mm. diameter, with five copper rings and cover, and four are 100 mm. diameter, with three concentric rings and cover; size, 580 x 340 x 130 mm. Same general appearance as No. C-18955 illustrated above.

Each . . . . . Net 30.00

**C-18947 Water Bath**—Same as above No. C-18945, but arranged with coil for heating with steam.

Each . . . . . Net 37.50

**C-18950 Water Bath**—Same as above No. C-18945, but electrically heated.

Each . . . . . Net 90.00

**C-18955 Water Bath**—Same as No. C-18945, but with four openings, each 125 mm. diameter, size, 340 x 340 x 130 mm.

Each . . . . . Net 21.00

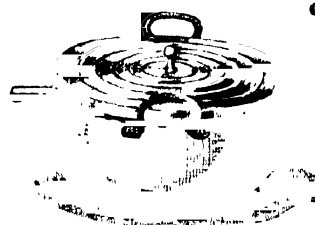
**C-18960 Water Bath**—Same as No. C-18955, but arranged with coil for heating with steam.

Each . . . . . Net 27.75

**C-18965 Water Bath**—Same as No. C-18955, but electrically heated.

Each . . . . . Net 67.50

Prices subject to change without notice



C-18970

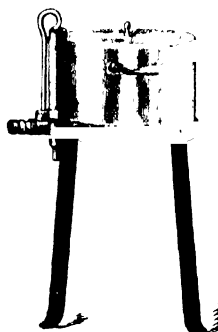
### C-18970 Water Bath—

Made of heavy copper, tin lined, and provided with steam escape and set of concentric rings, hemispherical form.

	No.	A	B	C	D
Diameter, cm.		10	13	14	15
Each		1.50	1.70	2.20	2.50

	No.	E	F	G
Diameter, cm.		20	25	31
Each		3.75	7.25	13.00



C-18995

### C-18995 Water Bath—Tripod—Of

polished copper, tin lined, with concentric rings and water level regulator, diameter, 15 cm., depth, 10 cm., height of tripod, 23 cm.

Each . . . . . 8.75

### C-19050 Wire—Copper.

	No.	A	B	C	D	E	F
Gauge, B & S.	16	18	20	22	24	26	
1/4-lb. spools, per spool.	20	20	20	20	22	23	

	No.	G	H	I	J	K
Gauge, B & S.	28	30	32	34	36	
1/4-lb. spools, per spool.	30	35	42	54	85	



C-19075

**C-19070 Wire Gauze—Iron**—In squares; for supporting dishes, etc.

	No.	A	B	C	D	E	F
Size, mm.		75	100	125	150	175	200
Each		.04	.05	.08	.11	.15	.18

**C-19075 Wire Gauze—Iron**—In squares, with asbestos center, for supporting dishes, etc.

	No.	A	B	C
Size, mm.		100	120	150
Each		.12	.15	.16

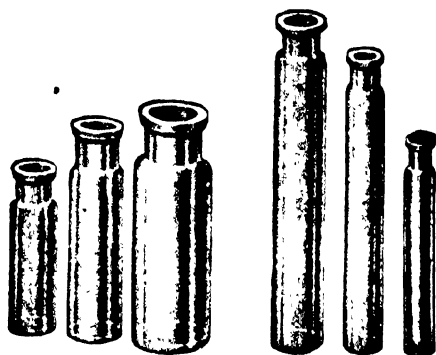
**C-19080 Wire Gauze—"Nichrome"**—16 mesh of No. 24 wire.

	No.	A	B	C
Size, in.		4 x 4	5 x 5	6 x 6
Each		Net .45	.65	.95
Per square foot		Net		3.50

**C-19085 Wire Gauze—Nichrome**—20 mesh of No. 27 wire.

	No.	A	B	C
Size, in.		4 x 4	5 x 5	6 x 6
Each		Net .60	.90	1.30
Per square foot		Net		5.00

Continued on Next Page



C-5460

C-5465

C-5460 Vials—Homeopathic, short form, with neck, flat bottom for cork stopper

No.	C	D	F	H	I	J
Capacity, drams		1	2	4	6	8
Per gross	1.15	1.15	1.35	2.70	3.60	4.50

C-5465 Vials—Homeopathic, long form, with neck, flat bottom for cork stopper

No.	C	D	F	H	I	J
Capacity, drams		1	2	4	6	8
Per gross	1.15	1.15	1.35	2.70	3.60	4.50



C-5470

C-5470 Watch Glasses—Of well-annealed glass, thin, concave, with edges smoothly ground

No.	C	D	E	F	G	H
Diameter, mm	40	50	65	75	85	100
Per ten	.40	.70	.80	.95	1.05	1.25

No.	I	J	L	N	O
Diameter, mm	115	125	150	175	200
Per ten	1.40	1.55	1.65	2.75	3.40

C-5475 Watch Glasses—In pairs, with edges accurately ground together, not to be confused with counterpoised watch glasses

No.	A	B
Diameter, mm	50	65
Per pair	.30	.35

C-5480 Watch Glasses—Balance—Counterpoised in pairs, accurately adjusted for interchangeable use on analytical balance pans

No.	B	BB	C
Diameter, mm	65	70	75
Per pair	Net 1.35	1.35	1.35



C-5490

Prices subject to change without notice

C-5490 Watch Glasses—Square form, consist of glass blocks, 40 mm square, with a concavity, one vertical surface ground for writing on, bottom of concavity fairly flat but with mold, or unpolished finish with cover

Per ten 1.00

C-5495 Watch Glasses—Square form—Same as No. C-5490 above, but with polished, spherical cavity

Per ten 4.25



C-5497

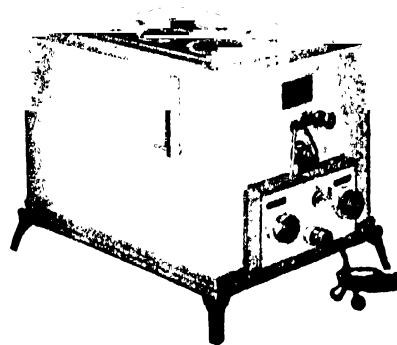
C-5497 Watch Glasses—Syracuse Solid—Improved form, most convenient for handling without danger from dropping and will withstand more hard usage without breaking or chipping than any other form; bottom surfaces are parallel, making it possible to examine objects in the glass without distortion, while the slight curvature around the inside of the bottom permits the easy use of the section filter; flange around the bottom permits the glasses to be stocked securely

Per ten 70

C-5498 Watch Glasses—Syracuse Solid—Same as No. C-5497 above, but with ground, beveled surface for writing on

Per ten .95

## WATER BATHS



C-18923

C-18922 Water Bath—Freas' Electric—Automatically controlled, consists of heavy copper tank with heavy asbestos outer covering, has working space 4 in. deep by 12 in. by 18 in., constant temperature regulator is the standard Freas bimetallic; without cover, constant temperature range is from room temperature up to about 65°C.

Each Net 150.00  
(Please state voltage and current when ordering.)

C-18923 Water Bath—Freas' Electric—Similar to No. C-18922, but with cover, temperature range is from room temperature up to about the boiling-point of water

Each Net 180.00

(Please state voltage and current when ordering.)

Continued on Next Page

		100 g	250 g	500 g			100 g	250 g	500 g
Ammonium Hydrate, C.P.	GSB	24	35	52	Write for quotation in 130 lb drums				
Ammonium Hydrate, Pure	GSB	4lb bottles		1.30	Calcium Chloride, C.P., Gran.	CB	17	22	32
Ammonium Hydroxide	GSB	4lb bottles		1.28	Calcium Fluoride, Pure	CB	21	30	46
Ammonium Methylate, C.P.	CB	24	35	52	Calcium Metal	Can	25 g		1.80
Ammonium Nitrate, C.P.	CB	93	170	295	Calcium Oxalate, C.P.	CB	50	82	140
Ammonium Nitrate, Pure	CB	32	50	80	Calcium Oxide (from Marble)	CB	17	22	32
Ammonium Oxalate, C.P.	CB	20	29	44	Calcium Phosphate, Pure, Primary	CB	24	37	65
Ammonium Oxalate, Pure	CB	30	66	110	Calcium Phosphate, C.P., Secondary	CB	40	64	108
Ammonium Perchlorate, C.P.	CB	37	58	98	Calcium Phosphate, C.P., Tertiary	CB	40	64	108
Ammonium Phosphate, C.P.	CB	43	68	115	Calcium Sulfate, C.P.	CB	23	40	53
Ammonium Phosphate, C.P., Primary	CB	47	78	130	Calcium Sulfate, Pure, Precip.	CB	21	39	50
Ammonium Sulfate, C.P.	CB	27	35	55	Calcium Sulfide, Pure	CB	32	50	80
Ammonium Tartrate, C.P.	CB	51	83	140	Carbon Bisulfide, C.P.	CB	24	34	54
Ammonium Potassium Tartrate, Pure	CB	25 g		25	Carbon Bisulfide, Tech.	CB	13	18	29
Ammonium Thiocyanate, C.P.	CB	53	95	150	Carbon Tetrachloride, C.P.	CB	27	41	66
Amyl Acetate, Pure	CB	63	88	150	Cerium Nitrate	GSB			2.45
Aniline Hydrochloride, C.P., Cryst. and Pure	CB	49	80	140	Cerium Oxalate, U.S.P.	CB	35	53	87
Aniline Oil, C.P.	CB	88	61	100	Charcoal, Bone, Granular	CB	25	37	58
Aniline Sulfate, C.P., Cryst.	CB	45	72	125	Charcoal, Bone, Powd.	CB	32	50	81
Antimony Metal	Cart	21	30	45	Charcoal, Blood, C.P.	CB	57	96	165
Antimony Pentachloride, C.P.	GSB	48	95	159	Chloroform, U.S.P.	CB	26	44	77
Antimony Pentoxide, C.P., Powd.	CB	32	88	145	Chromium Chloride, C.P., Dry	CB	79	135	235
Antimony Trichloride, C.P.	GSB	45	69	105	Chromium Nitrate, C.P., 40%	GSB	47	71	112
Antimony Trioxide, C.P., Powd.	CB	33	36	62	Chromium Sulfate, C.P., 30%	GSB	36	52	71
Antimony Trisulfide, C.P., Red (ous)	CB	72	124	215	Cobalt Chloride, Pure	GSB	25 g		32
Antimony Potassium Tartrate	CB	42	68	115	Cobalt Nitrate, C.P., Cryst.	CB	77	132	230
Arsenic Metal, Pure	CB	52	87	146	Cobalt Oxide, C.P., Powd.	CB	135	240	425
Arsenic Sulfide, Yellow	CB	25	39	69	Collodion, U.S.P.	CB	25	37	56
Arsenic Sulfide, Red	CB	31	49	75	Copper Turnings	Cart	17	23	30
Asbestos, Medium Fiber	Cart	65	112	190	Copper, Electrolytic, Sheet, 0.008"	Paper			1.05
Asbestos, Long Fiber, washed in acid and ignited	Cart	79	138	235	Copper, Electrolytic, Foil, 0.002"	Paper			1.63
Ascarite	Per lb			4.50	Copper Acetate, C.P., Cryst.	CB	45	72	122
Barium Acetate, C.P.	CB	40	64	105	Copper Acetate, Pure Basic, Powd.	CB	34	48	80
Barium Carbonate, C.P.	CB	31	50	80	Copper Ammonium Chloride, C.P., Cryst.	CB	30	46	73
Barium Chloride, C.P.	CB	22	31	49	Copper Carbonate, Precip.	Cart	24	36	55
Barium Chloride, Pure	Cart	20	25	40	Copper (ic) Carbonate, C.P., Basic	CB	45	72	122
Barium Dioxide, C.P., Powd.	CB	31	49	78	Copper (ic) Chloride, C.P., Cryst.	CB	30	46	75
Barium Hydroxide, C.P., Cryst.	CB	24	36	55	Copper (ous) Chloride, C.P., Cryst.	CB	47	76	130
Barium Nitrate, C.P.	CB	27	43	67	Copper (ic) Nitrate, C.P., Cryst.	CB	31	49	78
Barium Nitrate, Tech.	CB	20	29	43	Copper (ic) Oxide, C.P., Black	CB	43	68	115
Barium Sulfide, Pure Gray 60%	CB	24	36	55	Copper (ous) Oxide, C.P., Red	CB	48	95	160
Barium Sulfate, Pure for X-ray	CB	20	25	40	Copper Sulfate, C.P., Cryst.	CB	26	39	61
Benzaldehyde, U.S.P.	CB	57	96	166	Copper Sulfate, Pure, Cryst.	CB	18	25	40
Benzidine, C.P., for Blood Test	25 g			65	Copper Sulfate, C.P., Anhyd.	CB	38	62	100
Benzoyl Chloride	GSB	68	114	195	Copper Sulfide, Precip.	CB	48	91	155
Beta Naphthol, U.S.P.	CB	44	72	120	Cresol, U.S.P.	CB	20	26	43
Bismuth Carbonate, C.P.	CB	106	185	330	Dextrin, White Powd., N.F.	Cart			20
Bismuth Chloride, C.P., Cryst.	CB	106	185	330	Dextrose, C.P., Powd.	CB	83	141	250
Bismuth Hydroxide, C.P.	CB	115	200	352	Dimethylglyoxime	CB	25 g		1.65
Bismuth Metal	Cart	85	142	235	Diphenylamine, Tech.	CB	50	89	150
Bismuth Nitrate, C.P.	GSB	87	145	240	Ether, U.S.P.	Can	20	30	37
Bismuth Oxide Hydrated	CB	110	195	345	Ether, C.P. (distilled over sodium)	Can	41	68	121
Bismuth Oxide, C.P.	CB	106	185	330	Ether, Acetic, U.S.P.	CB	25	37	55
Bismuth Oxychloride, C.P., Powd.	CB	106	185	330	Ether, Nitrous, Conc 1-21	CB	46	71	142
Bismuth Subcarbonate, U.S.P.	CB	76	135	295	Ether, Petroleum, Spec, B.P., 25°-140°C	Can	32	50	88
Bismuth Subnitrate, C.P., Powd.	CB	106	185	330	Ferric Chloride C.P., Lumps	CB	23	34	53
Bone Charcoal, Powd.	Cart	31	49	74	Ferric Chloride, Pure	CB	23	34	41
Borax Glass, Powd.	Cart	27	41	65	Ferric Oxide, C.P.	CB	35	54	90
Borax, U.S.P.	Cart			27	Ferrous-Ammonium Sulfate, C.P., Cryst.	CB	26	38	61
Bromine, C.P.	GSB	40	66	135	Ferrous Chloride, C.P., Dry	CB	34	54	90
Cadmium Bromide, C.P., Cryst.	CB	82	140	245	Ferrous Sulfate, C.P., Powd.	CB	31	48	78
Cadmium Chloride, C.P., Cryst.	CB	82	140	245	Ferrous Sulfate, C.P., Anhyd.	CB	15	16	23
Cadmium Iodide, C.P., Cryst.	CB	185	330	590	Ferrous Sulfide, Sticks	Cart			
Cadmium Metal, Mossy	Cart	65	112	190	Write for quotation in larger quantities	Cart	16	17	21
Cadmium Metal, Sticks	Cart	55	92	155	Ferrous Sulfide, Lumps	Cart	10	11	20
Cadmium Metal, Granular	Cart	65	112	190	Fluorspar	Cart	23	30	38
Cadmium Nitrate, C.P., Cryst.	CB	75	130	230	Formaldehyde, U.S.P., 36-40%	CB	44	63	100
Cadmium Sulfate, C.P., Cryst.	CB	75	130	228	Fusel Oil	CB	21	32	45
Caffeine, U.S.P.	Cart	340	540	840	Glycerine	CB			
Calcium Acetate, Pure Dried	CB	24	37	65					
Calcium Carbonate, C.P.	CB	35	56	94					
Calcium Carbide, Lumps	Can			30					
Calcium Chloride, C.P., Anhyd.	CB	37	60	100					
Calcium Chloride, Tech. (for Desiccators)	Can		19	29					

Prices subject to change without notice

Continued on Next Page

# THE WILL CORPORATION

1065

		100 g	250 g	500 g			100 g	250 g	500 g
Gold Chloride, Cryst., Brown	CB	25 g	.	13.50	Nickel Oxide, Black, C.P.				
Gold-Sodium Chloride, Photo	CB	25 g	.	6.50	Powd.	CB	86	148	260
Gold-Sodium Chloride, U.S.P.	CB	25 g	.	8.00	Nickel Metal, Shot	CB	32	50	85
Hexamethylenetetramine	Cart	50	88	133	Nickel Nitrate, C.P.	CB	48	80	135
Hydrogen Peroxide, 3% U.S.P.	CB	.	.	25	Nickel Sulfate, C.P., Cryst.	CB	45	73	122
Hydroquinone	Cart	69	112	247	Nickel Ammonium Sulfate,				
Hydroxylamine Hydrochloride,					C.P., Cryst.	CB	30	46	75
Cryst.	CB	590	1000	1800	Nitrobenzene (Mono)	CB	30	37	50
Indigo Carmine, U.S.P., Dry	CB	120	210	375	Paper, Litmus		100 Strips per tube, each		10
Iodine Resublimed, U.S.P.	GSB	143	270	526	Paraldehyde, U.S.P.	CB	41	70	126
Iron Powder	Cart	25	37	55	Phosphoric Anhydride, Powd.	GSB	51	80	125
Iron Filings, Free from Grease	Cart	.	.	20	Phosphorus Oxychloride	GSB	53	90	160
Iron Ferrocyanide Sol.	CB	50	80	125	Phosphorus Pentachloride	GSB	37	60	110
Lactose (Milk Sugar), U.S.P.,					Phosphorus Red, Powd.	CB	44	72	120
Powd.	Cart	21	34	47	Phosphorus Trichloride	GSB	40	64	125
Lead Acetate, C.P., Basic, Dry	CB	35	54	90	Phosphorus, Yellow, Sticks	CB	32	50	80
Powd.	CB	28	43	70	Platinum Chloride, Cryst.	GSB	25 g	.	37.00
Lead Carbonate, C.P., Basic,					Potassium Ammonium Sulfate,				
Powd.	CB	33	51	84	C.P., Cryst.	CB	34	54	86
Lead Chloride, Pure	CB	41	70	125	Potassium Antimonate, C.P.,				
Lead Metal, Gran. Ag. Free					Powd.	CB	110	195	340
(Test lead)	CB	24	36	55	Potassium Bicarbonate, C.P.	CB	31	48	78
Lead Metal, Shot	Cart	.	.	20	Potassium Bicarbonate, U.S.P.,				
Lead Metal, Corbl., Mossy	Cart	22	35	50	Cryst.	Cart	23	34	40
Lead Nitrate, C.P., Cryst.	CB	27	40	64	Potassium Bichromate, C.P.	CB	33	51	83
Lead Oxide, C.P. (Litharge)	CB	22	32	47	Potassium Bichromate, Pure,				
Lead Oxide, Brown, Pure	CB	46	72	115	Cryst.	Cart	23	34	40
Lead Oxide, C.P. (Red Lead)	CB	26	39	59	Potassium Binoxidate, Cryst.	CB	40	64	85
Lead Peroxide, C.P., Powd.	CB	33	51	82	Potassium Bisulfate, C.P.,				
Lead Sulfate, Pure	CB	47	64	85	Cryst.	CB	36	67	94
Lithium Nitrate, C.P., Cryst.	CB	100	175	305	Potassium Bisulfate, C.P.,				
Lithium Carbonate, C.P.,					Fine (C.P.)	CB	38	61	100
Powd.	CB	94	165	290	Potassium Bromate, C.P.	CB	52	86	148
Lithium Sulfate, C.P., Cryst.	CB	84	145	255	Potassium Bromate, U.S.P.,				
Litmus Cubes	Cart	55	90	150	Gran.	CB	21	35	47
Magnesium Carbonate, C.P.,					Potassium Bromide, C.P.	CB	31	48	78
Basic	CB	40	64	105	Potassium Carbonate, C.P.,				
Magnesium Carbonate, Powd.,					Cryst.	CB	28	43	70
U.S.P.	Cart	23	34	42	Potassium Carbonate, U.S.P.,				
Magnesium Chloride, C.P.,					Powd.	CB	23	34	40
Cryst.	CB	23	33	52	Potassium Chlorate, C.P.	CB	27	41	66
Magnesium Metal, Powd.	Lbs	115	205	345	Potassium Chlorate, U.S.P.,				
Magnesium Metal, Ribbon	Lb oz rolls	.	.	65	Gran.	Cart	23	35	43
Magnesium Nitrate, C.P.,					Potassium Chloride, C.P.	CB	30	46	76
Cryst.	CB	30	46	76	Potassium Chloride, Pure,				
Magnesium Oxide, C.P., Powd.	CB	66	110	190	Cryst.	CB	21	33	42
Magnesium Oxide, U.S.P.,					Potassium Chloride, Pure	CB	21	33	42
Heavy	Cart	40	57	110	Potassium Chloroplatinate	CB	1 g	.	2.50
Magnesium Sulfate, C.P.,					Potassium Chromate, C.P.	CB	49	80	138
Cryst.	CB	21	30	46	Potassium Chromate, Pure	CB	27	42	70
Manganese Carbonate, C.P.,					Potassium Cyanide, C.P.,				
Powd.	CB	38	61	100	Lumps	CB	66	110	195
Manganese Chloride, C.P.	CB	34	53	88	Potassium Cyanide, Tech.	CB	32	45	63
Manganese Dioxide, C.P.	CB	33	51	82	Potassium Ferrocyanide, C.P.	CB	47	76	130
Manganese Dioxide, Gran.	Cart	.	.	25	Potassium Ferrocyanide, Pure,				
Manganese Sulfate, C.P., Cryst.					Cryst.	CB	47	72	115
Fine	CB	34	53	88	Potassium Ferrocyanide, C.P.	CB	53	88	150
Marble Chips	Cart	.	.	15	Potassium Fluoride, Pure	CB	100	180	310
Mercury, C.P., Redistilled	Jug	100	180	300	Potassium Formate, Pure	CB	60	110	175
Mercuric Acetate, C.P.	CB	100	175	310	Potassium Hydroxide, C.P.,				
Mercuric Bromide, C.P., Cryst.	CB	25 g	.	60	Sticks	CB	34	54	90
Mercuric Chloride, C.P., Powd.	CB	.	94	160	Potassium Iodate, C.P.	CB	25 g	.	70
Mercuric Iodide, C.P., Powd.	CB	152	268	480	Potassium Iodide, C.P.	CB	110	190	340
Mercuric Nitrate, C.P., Cryst.	GSB	73	118	195	Potassium, Metal	GSB	25 g	.	1.50
Mercuric Oxide, Red, C.P.	CB	79	132	230	Potassium Nitrate, C.P., Cryst.	CB	33	51	85
Mercuric Oxide, Pure Powd.,					Potassium Nitrate, Purified,				
U.S.P.	Cart	50	83	146	Sticks	CB	54	90	155
Mercuric Oxide, C.P., Yellow					Potassium Oxalate, Neutral,				
Powd.	CB	90	152	270	C.P., Cryst.	CB	51	84	145
Mercurous Chloride, C.P.,					Potassium Perchlorate, C.P.,				
Powd.	CB	55	94	164	Cryst.	CB	38	61	100
Mercurous Nitrate, C.P., Cryst.	GSB	75	125	230	Potassium Permanganate, C.P.,				
Mercurous Nitrate, C.P., Powd.	CB	101	175	305	Cryst.	CB	49	81	138
Mercury Oxide, Black (ous)	CB	25 g	.	27	Potassium Phosphate, Second-				
Mercury Sulfide, Red	CB	100	175	310	ary, C.P., Cryst.	CB	54	90	155
Methyl Iodide, C.P., Liquid	GSB	25 g	.	1.35	Potassium Phosphate Primary,				
Methylene Blue, U.S.P.	CB	212	380	698	C.P., Cryst.	CB	52	87	150
Naphthol, Alpha-, C.P., Cryst.	CB	112	195	340	Potassium Phosphate, C.P.,				
Naphthol, Beta-, Resublimed	CB	44	72	120	Tertiary, Cryst.	CB	58	97	168
Naphthylamine, Alpha-, Cryst.	CB	69	119	205	Potassium Sulfate, C.P., Cryst.	CB	32	40	82
Naphthylamine, Beta-, Cryst.	CB	107	180	330	Potassium Sulfite, C.P., Cryst.	CB	54	90	155
Nickel Acetate, C.P. (ous)	CB	56	94	162	Potassium Tartrate, C.P., Cryst.	CB	50	83	141
Nickel Carbonate, C.P., Powd.	CB	63	105	182	Potassium Tetraoxalate, C.P.	CB	62	102	180
Nickel Chloride, C.P., Cryst.					Potassium Thiocyanate, C.P.	CB	65	100	195
(ous)	CB	52	86	148	Potassium-Sodium Tartrate,				
					U.S.P., Powd.	Cart	23	30	35

Prices subject to change without notice

Continued on Next Page

		100 g	250 g	500 g			100 g	250 g	500 g
Pyrogallol	CB	54	165	291	Sucrose, C.P., Cryst	CB	36	58	95
Pyroxylm, in Strips, Purified	GSB	25 g		100	Sulfur, Broken Lumps	Cart			15
Resorcin, U.S.P., Cryst	CB	95	175	310	Sulfur Chloride	GSB	34	47	59
Silver Chloride, C.P., Powd	CB	25 g		100	Sulfur, Precipitated	Cart	25	30	40
Silver Iodide, Pure	CB	25 g		100	Titanium Tetrachloride, Liquid	CB			170
Silver Metal, Precipitated	CB	25 g		140	Titanium Trichloride, 20% Sol	GSB			500
Silver Nitrate, C.P., Cryst	CB	298	535	970	Write for quantity price				
Soda Lamp, Maltion, Non-Hydroscopic	Absorbs 100% more				Toluene, C.P.	CB	26	39	61
CO <sub>2</sub> then ordinary soda lamp	Special quantity price	8.14			Uranium Acetate, C.P.	CB	25 g		89
mesh dry or 10% H <sub>2</sub> O	CB	25	37	60	Uranium Nitrate, C.P.	GSB	25 g		60
Sodium Acetate, C.P., Cryst	CB	24	34	55	Urea, Pure, Cryst	CB	85	125	210
Sodium Ammonium Phosphate, C.P., Cryst	CB	32	50	80	Wax, Carnauba	Cart	34	55	92
Sodium Arsenate, C.P., Cryst	CB	33	51	85	Wax, Ceresin, White	Cart	25	37	60
Sodium Arsenite, C.P., Powd	CB	34	54	87	Xylene, C.P.	CB	24	35	56
Sodium Benzoate, U.S.P.	CB	44	63	100	Xylene Chloride, C.P., Gran	CB	27	42	67
Sodium Bicarbonate, C.P.	CB	21	30	46	Zinc Metal, 20 mesh	Cart	26	38	60
Sodium Bicarbonate, Tech., Powd	CB			17	Zinc Metal, Strips, As-tree	Cart	32	48	77
Sodium Bichromate, C.P.	CB	27	42	67	Zinc Metal, Powd	Cart	25	30	38
Sodium Bisulfate, C.P.	CB	187	332	600	Zinc Oxide, C.P., Dry Process	CB	25	37	60
Sodium Bisulfate, C.P., Cryst	CB	24	35	55	Zinc Sulfate, C.P., Cryst	CB	26	39	62
Sodium Bisulfate, Meta., Fwd	CB	32	45	65					
Sodium Bisulfate, Pure, Dry	CB	23	34	40	<b>INDICATORS</b>			10 g	25 g
Sodium Borate, C.P., Cryst	CB	25	37	60	Aizarin			0.90	2.00
Sodium Bromate, C.P., Cryst	CB	56	94	160	Alpha-Naphtholbenzol			40	80
Sodium Bromide, C.P., Cryst	CB	31	47	75	Alpha-Naphthylamine			50	100
Sodium Carbonate, C.P., Cryst	CB	21	30	46	Azobitum, range about 6.8			2.00	3.75
Sodium Carbonate, C.P., Anhyd, Powd	CB	25	37	58	Benzopurpurin			50	100
Sodium Carbonate, U.S.P. Monohydrate	CB			25	Brilliant Green			75	150
Sodium Chromate, C.P., Cryst	CB	38	61	100	Bromocresol Purple, 5.2-6.8 Per 1/10 g, 25c				
Sodium Chloride, C.P., Cryst	CB	33	51	85	Bromophenol Blue, 2.8-4.5 Per 1/10 g, 25c				
Sodium Citrate, C.P., Cryst	CB	53	87	150	Bromothymol Blue, 6.0-7.6 Per 1/10 g, 25c			9.10	19.25
Sodium Cobalt Nitrate, C.P., Powd	CB	25 g		68	Carmine			2.00	5.00
Sodium Cyanide, C.P., Gran	CB	36	56	95	Carmine Acid				
Sodium Cyanide, Fused	CB	30	46	65	O-Carboxybenzazodimethylamine, range 4.4-6.0 Per 1/10 g, 25c				
Sodium Formate, C.P., Cryst	CB	58	97	168	O-Cresolsulfonephthalein, 7.2-8.8 Per 1/10 g, 25c			40	80
Sodium Fluoride, Tech	CB			34	Cochinal			25	50
Sodium Hydrate, C.P., Sticks	CB	27	41	66	Congo Red			50	100
Sodium Hydroxide, Tech., Gran	Can			22	Coralline				
Sodium Hyposulfite, Cryst	Cart			29	Cresol Blue, range 7.2-8.8 Per 1/10 g, 25c				
Sodium Iodate, C.P.	CB	25 g		84	Dibromocresolsulfonephthalein, 5.2-6.2 Per 1/10 g, 25c				
Sodium Iodide, C.P.	CB	155	275	490	Dibromocresolsulfonephthalein, 6.0-7.6 Per 1/10 g, 25c			50	110
Sodium Metal	Can	44	72	121	Dimethylaminoazobenzene, range 2.9-4.0			6.50	15.00
Sodium Nitrate, C.P., Cryst	CB	27	35	55	Dimethylaminoazobenzaldehyde			1.50	3.00
Sodium Nitrite, C.P., Sticks	CB	28	43	73	Dimethylglyoxime			30	50
Sodium Nitroprusside, C.P.	CB	25 g		70	Diphenylamine			150	310
Sodium Oxalate, C.P., Powd	CB	37	57	96	Diphenylaminazobenzene, range 1.2-2.1			75	160
Sodium Perborate, U.S.P.	Cart	31	48	77	Eosine			100	225
Sodium Peroxide, C.P.	Can	33	51	82	Ethyl Orange			75	150
Sodium Phosphate, C.P., Primary, Cryst	CB	35	56	94	Fluorescein			70	140
Sodium Phosphate, C.P., Secondary, Cryst	CB	24	34	55	Fuchsine, Acid			55	110
Sodium Phosphate, C.P., Tertiary, Cryst	CB	42	65	110	Fuchsine, Basic			225	500
Sodium Pyrophosphate, C.P., Cryst	CB	36	57	96	Hematoxylin, C.P.			120	245
Sodium Silicate, 40% Liquid	CB			28	Iodocarm			100	225
Sodium Sulfate, C.P., Anhyd, Powd	CB	50	83	140	Iatunus (purified powd)			60	120
Sodium Sulfate, U.S.P., Cryst	CB	17	26	35	M-Dinitrobenzoylene Urea, 6-8 Per g, 85c				
Sodium Sulfide, C.P., Cryst	GSB	42	61	95	Methyl Orange, range 3.1-4.4			50	100
Sodium Sulfite, C.P., Cryst	CB	21	30	45	Methyl Red, range 4.4-6.0			100	220
Sodium Sulfite, C.P., Anhyd	CB	26	40	64	Methyl Violet, range 0.1-3.2			60	120
Sodium Tartrate, C.P., Cryst	CB	38	62	102	Neutral Red, range 6.8-8.0			75	160
Sodium Thiocyanate, Pure	CB	31	50	85	Para-Nitrophenol, range 5.0-7.0			40	80
Sodium Thiosulfate, C.P.	CB	20	29	43	Phenacetol			100	220
Sodium Tungstate, C.P.	CB	71	120	210	Phenolphthalein, range 8.3-10.0			25	50
Stannic Chloride, C.P., Cryst	GSB	49	75	118	Phenol Red, range 6.8-8.4 Per 1/10 g, 25c				
Stannous Chloride, C.P., Cryst	CB	41	65	110	Phenolsulfonephthalein, 6.8-8.4 Per 1/10 g, 25c			75	150
Starch Iodide, Powd	CB	25 g		31	Phenylhydrazine			50	100
Starch, Potato	CB	19	28	55	Phenylhydrazine Hydrochloride			90	180
Starch, Soluble, Lintner	CB	55	92	160	Porrier's Blue			50	100
Strontium Bromide, U.S.P.	CB	20	43	68	Rosolic Acid, range 6.9-8.0			40	75
Strontium Carbonate, C.P.	CB	38	62	100	Sodium Nitroprusside				
Strontium Chloride, C.P.	CB	30	47	65	Tetrabromophenolsulfonephthalein, range 2.8-4.5 Per 1/10 g, 25c				
Strontium Nitrate, C.P., Cryst	CB	35	54	90	Thymol Blue (acid), 1.2-3.0 Per 1/10 g, 25c			500	
Strontium Sulfate, Pure	CB	43	68	110	Thymol Blue (alkaline), range 8.0-9.6 Per 1/10 g, 25c				
					Thymolphthalein, range 9.3-10.5				
					Thymolsulfonephthalein (acid), range 12-3.0 Per 1/10 g, 25c				
					Thymolsulfonephthalein (alkaline), range 8.0-9.6 Per 1/10 g, 25c				
					Toluyene Red			75	160
					Tropaeolin 0, range 11.1-12.7			60	130
					Tropaeolin 00, range 14-2.6			50	100
					Tropaeolin 000, range 7.6-8.9			50	100

# WILSON WELDER & METALS COMPANY

Incorporated

249 36TH STREET, BROOKLYN, N. Y.

## WILSON Plastic-Arc SYSTEM

(Trade Mark)

### PRODUCTS AND SERVICE

Wilson Plastic-Arc Welder and Plastic-Arc certified welding metals.

Welding of every description done by the Wilson Plastic-Arc welding system.

### WILSON PLASTIC-ARC WELDING SYSTEM

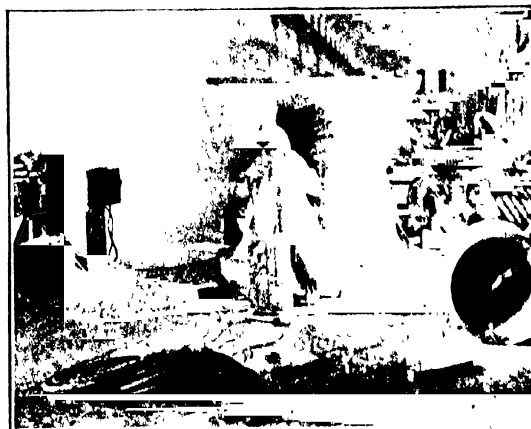
This system employs a flat compound wound 37½ volt, direct current generator, in connection with a panel containing an automatic control mechanism. This combination gives 18 to 22 volts at the arc, the rest of the power being used in the line and in the automatic power regulation. The advantage of the low voltage is that it prohibits the operator from making a long arc between the electrode and the work, which slugs the metal deposit. If the arc is lengthened it is weakened and must be brought back to a proper distance to make the weld, thus limiting the operator. Low voltage insures better penetration of the original metal by the concentrated arc than with a longer diffused arc of higher voltage.

Proper welding is accomplished by fusing the parent and new metal with a uniform welding heat. The heat is kept constant by the Wilson automatic mechanism mounted on the panelboard, an exclusive feature of the Plastic-Arc System.

All units are equipped with Plastic-Arc Automatic Regulating Panel (with improved indestructible, fool proof copper carbon resistor plates) insuring **Constant Heat Per Unit Area in the Weld.** This automatic control panel of the Wilson Plastic-Arc System is to welding what the Pyrometer is to the heat treatment of metals—it eliminates guesswork.

Plastic-Arc outfits are built in one, two and four-arc units, and four operators can draw energy from the same generator, each using a different heat as required on different metals without interference. A separate panel is required for each operator. The Plastic-Arc will weld practically any metal: cast, malleable and wrought iron, cast and rolled steel, bronze and brass, etc.

Damage on 20 German vessels, consisting of 118 major breaks which would have necessitated the renewal of 70 cast iron cylinders, some as large as 9 ft.



**CAST IRON CENTRIFUGAL DRYER BASE WELDED BY PLASTIC-ARC SYSTEM**

Weight 8500 lbs., crack 6 ft long, 1¼ in. thick

in diameter, were repaired with the Plastic-Arc system. The saving to the United States Government amounted to \$20,000,000.00 and twelve months of time, during which time ships transported over 500,000 troops overseas.

### PLASTIC-ARC CERTIFIED WELDING METALS

There are 8 grades of Plastic-Arc Certified Welding Metals and each can be depended upon, being guaranteed to give satisfactory results when employed upon the type of work it is designed for. These welding metals will give good results with any electric welding system.

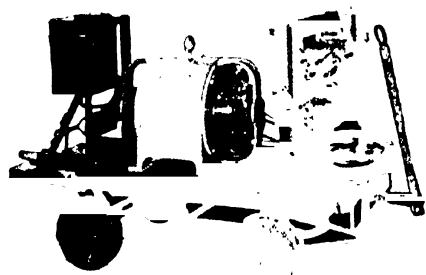
For machineable cast iron welds, without studs, specify Plastic-Arc Certified Welding Metal grade No. 12, furnished in 14" lengths and packed in 5-lb. container which affords full protection and eliminates waste. Special bulletin on welding metals supplied upon request.

### COMMERCIAL WELDING

This company solicits commercial welding of any description.

### BULLETINS

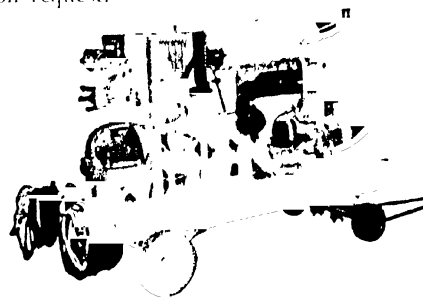
Wilson Plastic-Arc system and its uses are fully described in bulletins, copies of which will be supplied on request.



**STANDARD PORTABLE ONE ARC WITH KB PANEL**

One and Two Arc Stationary or Portable. Four Arc Stationary.

Standard Motor characteristics are 115, 230, 440, 550 volts D C ; 220, 440, 550 volts 60 cy 2 or 3 phase A. C. Other motor current furnished on specification.



**STANDARD 2 ARC GASOLINE ENGINE DRIVEN UNIT WITH KA PANELS**

Also furnished in one arc capacity

# THE WINNER COMPANY

30 CHURCH STREET, NEW YORK, N. Y.

## DISTRIBUTORS

Buffalo, N. Y. Cyclone Grate Bar Co., 70 Grimes Street  
 Chicago, Ill. L. S. Shaw & Co., 31 W. Jackson Boulevard  
 Cleveland, O. L. S. Shaw & Co., 7116 Euclid Avenue  
 Columbus, O. L. S. Shaw & Co., Con. Rock Building  
 Detroit, Mich. L. S. Shaw & Co., 6282 Beaubien Street  
 Toledo, O. L. S. Shaw & Co., Spitzer Building

Grand Rapids, Mich. L. S. Shaw & Co., Grand Rapids Savings Bank  
 Indianapolis, Ind. L. S. Shaw & Co., Merchants Bank Building  
 New Orleans, La. J. H. Rockwell, 712 Poydras Street  
 Pittsburgh, Pa. L. S. Shaw & Co., Bessemer Building  
 Springfield, Mass. F. D. Shaw, 110 Firlgide Avenue

## PRODUCTS

**Winner Steam Traps.**  
**Winner Temperature Regulators.**  
**Winner Boiler Compound.**

### WINNER STEAM TRAP

**Adaptability**—The Winner Steam Trap is adaptable to all purposes and all apparatus requiring removal of condensation with dispatch and economy, will remove condensation as fast as it flows to the trap whether in small quantity or heavy flow, up to its capacity, providing the inlet pressure is sufficiently great to overcome the outlet pressure or head that it may have to operate against.



THE WINNER STEAM TRAP

**Construction**—Rugged, fitting it for constant heavy duty. The valves are made of special Steam Metal, the Discs of Special Metal and Seats of Monel Metal, making them the best possible combination to stand the wear incidental to all traps. The Valve Disc is made with a deflector preventing the water from striking the walls of the valve and wearing through.

**Repairs**—Can be repaired as easily as an ordinary Globe Valve.

**Operation**—The Winner Steam Trap disposes of water or condensation automatically without waste of steam, responding to the slightest change of temperature; a change of one degree will cause it to operate at the proper time. There is no hesitation; it acts instantly and keeps all steam lines and other apparatus connected with it clear of condensation at all times, thereby proving the efficiency of the apparatus. It is always ready, impossible to become air-bound—the valve is always open until dry steam fills the body or expansion tubes of the Trap, therefore all cold water and air must pass out before Trap will close. This feature alone eliminates the necessity of by-pass valves, air-valves or other means of relieving the apparatus to obtain quick circulation. Does not require an elaborate layout or great space, taking up very little more space than the pipe that it is connected to. The Trap is provided with a test-cock on its valve body so an inspection can be made at any time to see that it is operating properly and not blowing through.

This Trap is the result of years of experience and experimental trials of a practical Engineer who has

made Steam Traps a lifelong study and merits of same have been proven after years of thorough practical tests. It is being used with very satisfactory results in Power Plants, Laundries, Steamships and practically every imaginable kind of manufacturing, working exceptionally well on jacketed kettles for boiling, also on vulcanizing equipment, working both on high or low pressure, also on hot water.

**Stock**—The Winner Steam Traps are for general use on high and low pressure steam and are built in sizes from  $\frac{1}{2}$ " pipe connections up—stock sizes  $\frac{1}{2}$ " to 2", larger sizes built special. Prices on request.

### WINNER TEMPERATURE REGULATOR

This Temperature Regulator operates on expansion and contraction caused due to change of temperature and is working very satisfactorily on Hot-Water Heaters, Condensers and in fact under practically all conditions where the temperature must be controlled so as not to go above or below a certain degree.

### WINNER BOILER COMPOUND

Formation of scale in boilers, also pitting and corrosion is a matter of vital importance, it not only being dangerous but is also expensive from the point that the boiler is not producing the efficiency that is expected and is the subject of innumerable articles in Scientific and Trade Journals throughout the country, and manufacturers and steam users cannot give it too much consideration.

Winner Boiler Compound is an eradicator and preventive of scale formation in boilers. It removes and prevents incrustation and corrosion in steam boilers. Contains nothing that is injurious to the iron, brass or packing; acts by dissolving scale and other precipitated solids contained in the water, into a soft sludge which can readily be blown off.

If directions are followed it will remove old scale and prevent formation of new scale, as its action tends to coat the interior of the boiler after old scale had been removed and also holds any foreign matter that may be in the water in solution.

Winner Boiler Compound is a liquid and we recommend about one gallon to every 1,000 H.P. every twenty-four hours as sufficient to produce satisfactory results.

If your boilers are scaled, corroded or pitted advise us your conditions and we will be glad to send trial package on approval.

The policy of this company is to satisfy our customers and we are perfectly willing at all times to place our goods in on trial subject to approval.

Consult any of above Distributors regarding the Trap or Regulator or advise us direct your conditions.

The Distributors are not handling the Boiler Compound.



# WINSLOW & COMPANY, INC.

Clay Products  
PORTLAND, ME.

## PRODUCTS

Vitrified Drainer Brick and Special Clay Products for the Chemical Industries.

Vitrified Clay Specialties for Pulp and Paper Mills, Acid Manufacturers, Fertilizer Plants, Explosive Plants, etc.

Sectional Conduit for Underground Pipe Covering.

Standard Sewer Pipe and Fittings.

Standard Fire Brick.

Special Fire Brick and Tile Shapes to order.

## FACILITIES

Our plant is located at Portland, Me., within the terminals of the Boston & Maine, Maine Central and Grand Trunk Railroad Systems. These rail connections coupled with our splendid docking facilities enable us to procure low freight rates and make shipments to all parts of the world.

## SERVICE

Our motto is service, and if you will send us your blue prints on which to figure we will gladly furnish prices and samples. Further data concerning anything mentioned on this page will be furnished promptly and we are always pleased to consider the manufacture of special products in our line.

## ACID RESISTING BRICK

We are large manufacturers of digester brick for lining sulphite pulp digesters, absorbing towers, reclaiming tanks, acid tanks, pickling vats, leaching batteries, bleach tanks, acid tower brick, acid floor brick, tile, etc. Our brick enjoys the enviable reputation for reliability and durability. While all acid resisting brick will disintegrate to a certain extent in the course of time, it has been found that our products, on account of the care taken in the selection of materials and our experience in manufacturing, will last much longer than the average. The best proof of this statement is the large number of important manufacturers who insist on using our products in preference to any other.



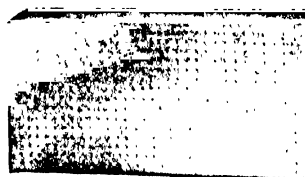
PULP  
DIGESTER  
SHOWING  
BRICK  
LINING

## COMPLETE BRICK LINED BLOW-PITS

New sulphite mills or plants contemplating renewals of old wooden blow-pits are fast adopting the more up-to-date Complete Brick Lined Blow-Pit, considering that it is almost as essential to have the roof, sides and bottoms of a blow-pit lined with brick as it is to line a sulphite digester with brick.

## VITRIFIED DRAINER BRICK

Our Vitrified Drainer Brick with straight edge were first introduced by us for draining rag pulp and bleach drainers in paper and pulp mills and are recognized as standard for this kind of work. The cut of Beveled Edge Drainer Brick below is a type especially adapted for sulphite blow-pits and is fast displacing the old perforated plank drainers, being held in place by V-shape strips of wood. They cannot be displaced by pressure from underneath.

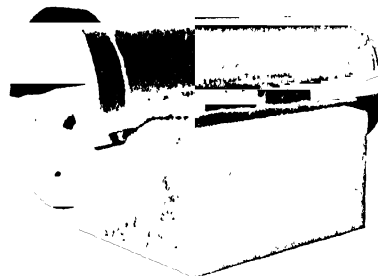


BEVELED EDGE DRAINER BRICK

Chemical Engineers will find this material useful whenever it is desired to construct equipment for washing, leaching, filtering or draining materials on a large scale. For instance, in bleacheries, textile finishing plants, dye houses, tanneries, pulp and paper mills, chemical works, food products, etc. The floor of the tank, being completely level and free from all irregularities, can be washed or flushed off readily and it is of sufficient strength to permit workmen to walk on it for purposes of washing, scraping or removing materials.

## PORTLAND SECTIONAL CONDUIT PIPE

This illustration represents a slotted section of conduit pipe resting on a cement base. Imbedded in this base are two iron sockets which extend up through slots in the clay pipe to carry the roll frames which are recommended for supports of heavy lines of steam pipe. On smaller lines we furnish a type of roller



PORTLAND SECTIONAL CONDUIT PIPE

frame which cements to the inside surface of pipe and requires no base under it. This type of clay conduit pipe is so cut that when sections are placed together it affords a watershed joint that is more practical than the old fashioned channel pipe, and these special sections for carrying roll frames are much less expensive than the old cumbersome T-joints. This form of insulation is especially adapted for distributing steam from central heating plants to outlying buildings.

# R. D. WOOD & CO.

## Engineers—Machinists—Iron Founders

400 Chestnut St., PHILADELPHIA, PA.

### PRODUCTS

**Cast Iron Pipe and Fittings; Gate Valves; Check and Foot Valves; Fire Hydrants; Centrifugal Pumps; Gas Producers; Gas Holders; Large Loam Castings; Sugar House Machinery; Hydraulic Machinery.**

**Constructors of Gas and Water Works and Complete Producer Gas Installations.**

### CAST IRON PIPE AND FITTINGS

Our pipe and fittings are based on the specifications of the American Society for Testing Materials and the American Water Works Association. For unusual sizes not given in the above specifications, we follow the general line and formula used in calculating the regular tables.

We have for many years made a specialty of the manufacture of cast iron pipe of all kinds and sizes; our experience dates from the introduction of pipe into this country.

Our regular sizes now range from 1" to 84" inside diameter. All our pipe is tested under water pressure at our works before shipment. We aim to carry a full line of regular sizes, and can make prompt shipment to any part of the world.

In addition to the regular bell and spigot pipe we carry a large line of flanged and flexible joint pipe, and are prepared to furnish at all times turned or bored pipe similar to that used in England and on the Continent of Europe. We also have patterns for High Pressure pipe as well as Special Hydraulic and Condenser pipe.

### "REDUCED FITTINGS"

These were placed on the market by us some years ago, to meet a demand for fittings to be sold at a fixed price, instead of so much per pound. Outside of the large saving per piece, compared with price of regular gas and water fittings, they have the advantage of more ease in handling in a tight trench, and will fit where the longer fittings would be clumsy and necessitate the cutting of the pipe. This assures better and speedier work in fitting.

### MATHEWS' PATENT FIRE HYDRANTS

We invite particular attention to this hydrant, and claim that it is the most perfect hydrant that has yet been made.

With our method of enclosing the working parts in bronze, we consider these hydrants practically indestructible.

### ADVANTAGES

Special attention is directed to the anti-freezing qualities of these hydrants. The outside casing, the upper end of which makes a telescopic joint with the body, or post, of the hydrant, adds finish and



**MATHEWS' PATENT BRONZE LINED FIRE HYDRANT**

strength. Below the ground line it serves to form a dead-air chamber around the hydrant stock, thus providing a non-conductor, making the hydrant very secure against freezing, and obviating the necessity for packing or covering in extreme cold weather. The hydrant is therefore especially adapted for service in cold climates. The case has an end play or vertical motion of several inches independent of the hydrant proper, accommodating itself to the upheaval of the ground by frost, and effectually preventing the fracture of the hydrant or foot-bend. This sliding case is invariably furnished with Mathews' Hydrants, as even in warm climates it serves a further purpose, in admitting of the removal of the hydrant stock with all its working parts, including valves and valve seats, without digging up the ground about the hydrant. This lessens the cost of repairs.

### AUTOMATIC WASTE VALVE

The waste valve of this hydrant is positive and automatic, being so attached to the valve-rod that when the main valve is open the waste must be closed, when the main valve is closed, the waste is open, allowing the waste water to escape from the standpipe. The guides of the waste valve are closely fitted to grooves in the standpipe, so that there is no vibration in opening or closing the hydrant under any pressure, the rod and main valve being held rigidly to the center.

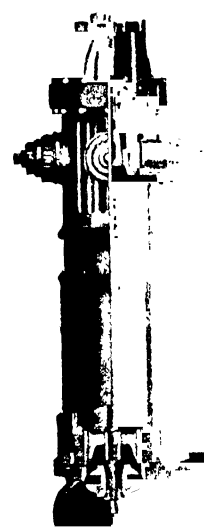
### MAIN VALVE

This is made of the best oak-tanned sole leather, thoroughly hammered and pressed, then turned in a lathe on its own centers to fixed gauges; thus they are readily interchangeable. Being turned to conical form to fit the conical valve seats, the closing of the hydrant is so gradual that there is no possibility of the "water hammer."

As the valve opens downward against the pressure of the water, the pressure is utilized in closing and holding the valve in place, and prevents loss of water or flooding of the streets in case the hydrant stock should be broken.

### MATHEWS' HIGH PRESSURE FIRE HYDRANTS

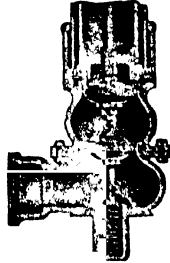
The installation in the United States and Canada of independent fire systems has resulted in greatly increased fire protection and a consequent reduction in in-



**MATHEWS' HIGH PRESSURE HYDRANT**

*Continued on Next Page*

surance rates. We have designed a high pressure fire hydrant along the lines of our standard Mathews' Hydrant, which has proved itself thoroughly reliable under the working pressure required by fire engineers throughout the country. This has been accomplished by means of a relief valve, which is attached to the main operating stem, and opens on the first few turns of the wrench, permitting the water to enter the body of the hydrant, equalizing the pressure and relieving strain on the main valve proper.



#### MATHEWS' PATENT DOUBLE VALVE FIRE HYDRANTS

This form of hydrant affords double security against leakage by the use of two main valves, one above the other. The lower valve is so constructed as to act as a supplemental or auxiliary valve, to allow the hydrant to be taken up without shutting off the water in the district.

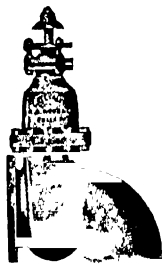
MATHEWS' PATENT  
DOUBLE VALVE FOR  
FIRE HYDRANT

#### GATE VALVES

We manufacture gate valves of various types and dimensions from 2" to 30" in diameter. All these valves are tested before shipment to 300 lbs. water pressure, and are carefully built to standard templates. We have special types of gate valves for use with our high-pressure fire hydrants.



STANDARD  
GATE VALVE



ANGLE VALVE



BY-PASS VALVE  
GEAR OPERATED

Our valves may be fitted with indicator posts, sliding stem and lever, and valve indicators. Angle valves with full size elbows can also be furnished. Large valves can be furnished with gears and by-passes.

#### ADJUSTABLE VALVE AND SERVICE BOXES

These are easily set and readily adjustable to variations in grade.

#### INDICATOR VALVE POST

This patented post shows plainly to the passerby whether the valve is open or shut, thus avoiding the delay of hunting under snow or dirt for a flush gate box, or delay in opening the cover of the box. Turning the spindle screws the tell-tale up or down so the proper sign appears in the opening at the head of the post. Locks and hand-wheels may be applied if desired.

#### RESERVOIR AND PUMP-HOUSE CONNECTIONS

Our standard designs meet the requirements in all essential details. Special forms are made to plans of customers.

#### HYDRAULIC TOOLS

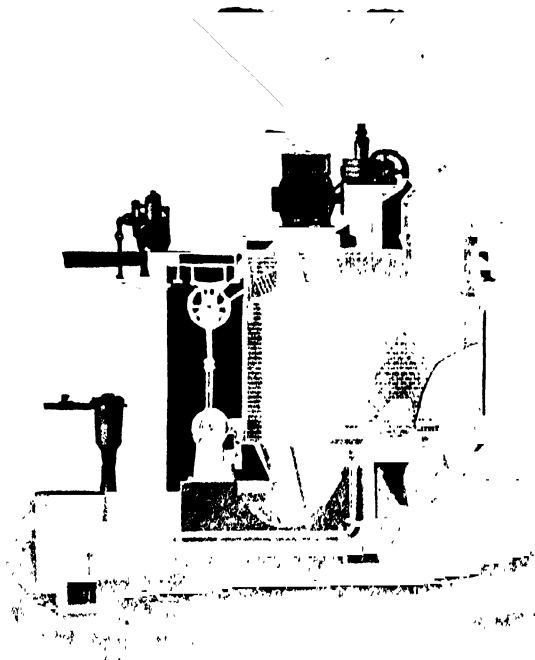
We design and build hydraulic tools for standard and special applications, including Flanging and Bending Presses, Intensifiers, Tower Cranes, Forging Presses, Automatic Punches, Pulpit Valves, Plate and Billet Shears, Hydraulic Operating, Check and Stop Valves, Beam Shears, Jib Cranes, etc. Send for our special catalog.

#### GAS HOLDERS

We design, construct and erect gas holders of both single and multi-bitt type, without or with steel tank.

#### AUTOMATIC GAS PRODUCERS

The large number of plants equipped with the Automatic Gas Producer have marked a new era in economical coal gasification which is worthy of investigation. We have prepared a special circular, which will be sent upon request. We welcome inquiries from those interested.



AUTOMATIC GAS PRODUCER

#### PUMPING INSTALLATIONS

We install complete pumping installations for steel works, mines, drainage, irrigation and water works. We can supply centrifugal pumps for all purposes either belt connected or direct connected and build high duty pumping engines of both the direct acting and flywheel type.

#### SPECIAL CASTINGS AND MACHINERY

We are prepared to furnish heavy iron castings of any size or weight for the chemical industries, also sugar house machinery and special equipment for all types of industrial plants.



SPECIAL CASTING

# WORTHINGTON PUMP AND MACHINERY CORPORATION

115 BROADWAY, NEW YORK, N. Y.

Blake-Knoshen Works  
East Cambridge, Mass.  
Deane Works, Holyoke, Mass.  
Snow-Holly Works, Buffalo, N. Y.  
Laudley Works, Elmwood, Ill. Chicago

FACTORIES  
Worthington Works, Harrison, N. J.

## WORTHINGTON

Gas Engine Works, Cudahy, Wis.  
Epping Carpenter Works,  
Pittsburgh, Pa.  
Power and Mining Works,  
Cudahy, Wis.  
Jeansville Works, Hazleton, Pa.

### PRODUCTS

**Pumps**  
Condensing Apparatus  
Air Compressors  
Gas Compressors  
Ammonia Compressors  
Filter Presses  
Water Wheels  
Feed Water Heaters  
Liquid Meters

**Oil Engines**  
Gas Engines  
Kerosene Engines  
Oil Mill Machinery  
Rock and Ore Crushers  
Converters  
Cement Machinery  
Metal Mining Machinery

### OPEN IMPELLER CENTRIFUGAL PUMPS, Class "C"

These pumps are especially suitable for contracting work, such as pumping out ditches and cofferdams. These pumps meet those situations calling for machines of sturdy design and reliable operation, where first cost is important. Belt driven standard, motor driven to order.



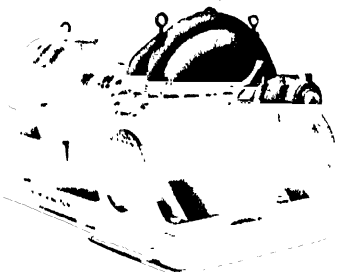
OPEN IMPELLER CENTRIFUGAL PUMP

CAPACITIES IN GAL. PER MIN. R.P.M. AND MOTOR HORSE-POWER

Size	Head or lift in feet				Size	Head or lift in feet			
	20	40	60	80		20	40	60	80
1" G.P.M.	18	26			3" G.P.M.	212	330	402	465
R.P.M.	1650	2120			R.P.M.	790	1070	1310	1515
H.P.	75	1.5			H.P.	1.25	8.0	13.5	21
1 1/2" G.P.M.	35	50			4" G.P.M.	410	610	746	860
R.P.M.	1385	1960			R.P.M.	650	920	1120	1300
H.P.	75	1.75			H.P.	5.25	13.5	23	35
2" G.P.M.	72	102	135		5" G.P.M.	600	905	1110	1290
R.P.M.	1100	1500	1900		R.P.M.	550	780	950	1090
H.P.	1.5	3.5	6.5		H.P.	7.5	18.5	32	50
2 1/2" G.P.M.	95	134	164	190	6" G.P.M.	810	1112	1400	1620
R.P.M.	915	1120	1620	1870	R.P.M.	474	670	820	950
H.P.	1.5	4.0	7.0	11	H.P.	8.5	18	35	53
3" G.P.M.	110	197	212	278	8" G.P.M.	1150	2050	2500	2900
R.P.M.	785	1110	1360	1570	R.P.M.	410	578	706	815
H.P.	2.0	5.0	8.5	13	H.P.	14.5	35	61.5	93

### DOUBLE SUCTION VOLUTE PUMPS, Class "B.S." and "O.S."

These pumps were designed for those conditions requiring a high grade efficient pump. The double suction principle insures freedom against end thrust. A number of design refinements such as a volute suction head contribute to make these machines especially efficient. Sizes 3" to 12" discharge. Capacities up to 7000 gal. per min. Suitable for heads or lifts up to 200 feet.



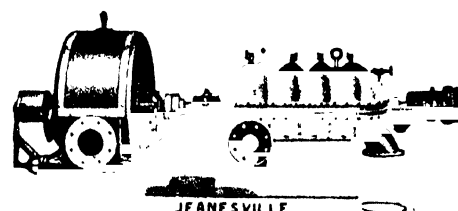
DOUBLE SUCTION VOLUTE PUMP

Patterns are on hand for larger sizes, up to 60", which can be built to meet special requirements.

This pump is designed with a great number of industrial and service requirements in mind. The result is a machine suitable for many services, in a standardized product. Slight modifications can be made to meet unusual service conditions. This pump has been used for pumping brine, light oils, mine water, acidulous water, sewage, slimes, etc.

### MULTISTAGE CENTRIFUGAL PUMPS

The pump illustrated is a double suction multistage centrifugal pump. It has been especially designed for boiler feeding in the small and medium sized units -- and has given excellent results as a water works pump and mine pump in the larger sizes.



MULTISTAGE CENTRIFUGAL PUMP

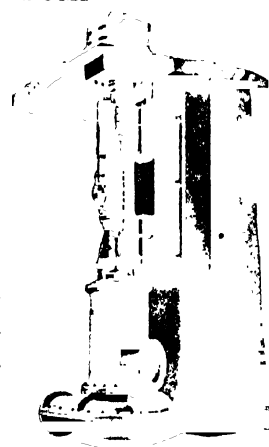
Sizes range from 4" to 10". Boiler horse-power capacity 2,000 to 35,000 per unit. Gallons per minute capacity ranges from 250 to 3,500. Suitable for any head or pressure over 160 feet or 70 pounds.

In addition to the pump described, there are a number of other multistage centrifugal pumps. These other designs are made in a range of sizes and types to include all high head pumping services.

### WORTHINGTON ANTISELL BOOTLEG VERTICAL CENTRIFUGAL PUMP

This pump was designed especially for handling solutions of sulphuric and mixed acids, and in connection with leaching processes. The impeller and casing are of special lead antimony composition and the design is such as to insure low velocity of solution throughout and consequent reduction of erosion and corrosive action on the lining. The elimination of stuffing boxes is a large factor in reducing wear.

Sizes 2 1/2" to 15" will handle from 100 to 4000 g.p.m. against moderate heads.

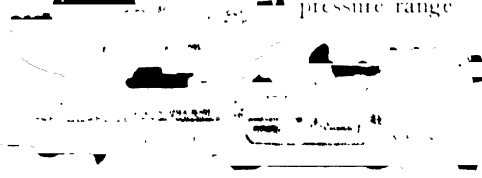


WORTHINGTON ANTISELL  
BOOTLEG VERTICAL CEN-  
TRIFUGAL PUMP

Continued on Next Page

### POT VALVE DIRECT ACTING STEAM PUMPS

The pump illustrated, while designed primarily for boiler feed service pressures up to 300 lbs., is also suitable for any clear water service requiring a steam driven pump for that pressure range.



POT VALVE DIRECT ACTING PUMP

In addition to the design shown, Worthington manufactures a complete line of pot valve high pressure steam pumps. This line embraces pumps suitable for pressures up to 2000 lbs., and in a list of sizes up to their largest triple expansion and cross compound Corliss pumping engines.

### DIRECT ACTING PISTON STEAM PUMPS

**General Service Pattern**--This is the standard trade pump for all ordinary services, and for water pressures not in excess of 200 pounds per square inch. These pumps are suitable for boiler feeding and all general water supply purposes. The water cylinders are brass-lined, the packed water pistons are submerged, and the water valve service is of composition. Bronze rods and brass water pistons are included in the regular construction of the first four sizes. On all other sizes these brass parts are extras and only furnished when especially ordered.



DIRECT ACTING PISTON GENERAL SERVICE PUMP

#### SIZES AND CAPACITIES

150 pounds steam pressure 200 pounds water pressure

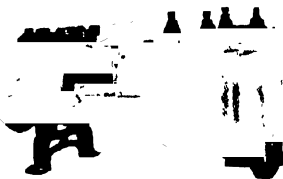
	3	4	5	6	7 1/2	9	10
Dia. Steam Cylinders	3	4 1/2	5 1/2	6	7 1/2	9	10
Dia. Water Pistons	2	2 1/4	2 3/4	3 1/2	4	5	6
Stroke	3	4	5	6	6	10	10
Gallons per Stroke Each Piston	0.41	0.69	1.01	2.08	3.26	5.10	9.40
Single Strokes per Minute Each Piston	110	100	100	90	80	70	70
Gallons per Minute	9	11	21	37	52	82	131

Other sizes up to 515 gallons capacity per minute. Water pressure 150 pounds.

**Removable Lining Pattern**--This pattern has been designed for severe services where the pump is subject to unusual wear, owing to the presence in the water of large quantities of grit, or due to any other cause. The water cylinders are fitted with brass linings, flanged, which are readily removable without taking out the pump. When the cylinder head has been taken off the linings may be withdrawn and replaced as easily as the pistons. This design is, of course, more expensive than the standard pattern, but will be found most useful for situations such as indicated above.

Sizes the same as general service pattern from 4 1/2 x 2 3/4 x 4 on up.

**Ball Valve Pattern**--Made in the same and larger sizes as the removable lining pattern. Especially adapted for pumping tar and other heavy liquids.



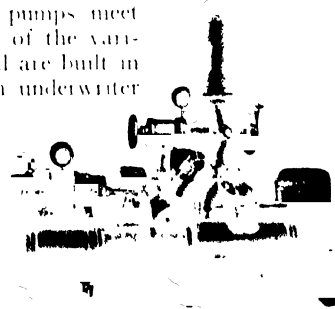
DIRECT ACTING BALL VALVE PISTON PUMP

**Other Patterns**--Besides the piston steam pumps described, Worthington makes a complete line of simplex and duplex pumps. These machines are manufactured in such sizes and types as to provide a pump suitable for every service requirement.

### FIRE PUMPS

Worthington fire pumps meet all the requirements of the various underwriters and are built in full accordance with underwriter specifications.

Besides the steam driven fire pumps shown there are other types available of Worthington make. These include power and centrifugal pumps.



DUPLIX DIRECT ACTING UNDERWRITER FIRE PUMP

#### SIZES AND CAPACITIES

Diameter of Steam Cylinders, Inches	11	16	18	20
Diameter of Water Plungers, Inches	7 1/4	9	10	12
Length of Stroke, Inches	12	12	12	16
Underwriter Rtg.	500	750	1000	1500
Gallons per min.	70	70	70	60
No. of Fire Streams	2	3	4	6

### FEATHER VALVE VACUUM PUMPS

(Reg. U. S. Pat. Off.)

These pumps are made with the same valves which have made Worthington Air Compressors so universally successful.

These Worthington Feather Valve dry vacuum pumps are used where high grade, economical vacuum pumps are desired.

They produce and maintain a high vacuum with but little horse power expended for driving the machine. Repairs and upkeep are quite low.

Besides the belt or power driven machines displayed and tabulated Worthington makes also a similar number of steam driven pumps.



FEATHER (Reg. U. S. Pat. Off.) VALVE VACUUM PUMP

#### SIZES AND CAPACITIES

Single Cylinder Machines						Duplex Machines					
Vacuum Cylinder	Stroke	Revs. per Minute	Displacement Cu. Ft. per Min.	Brake H. P. Required		Vacuum Cylinder	Stroke	Revs. per Minute	Displacement Cu. Ft. per Min.	Brake H. P. Required	
				27" Vacuum	Peak Load					27" Vacuum	Peak Load
7 1/2	6	300	32	3.0	5	18	12	200	1400	36	76
8 1/2	9	250	147	4.5	8	21	14	185	2040	52	110
12	9	250	200	7.5	14	23	16	165	2520	64	136
18	9	225	590	15	32	26	18	150	3300	84	180
18	12	200	700	18	38	26	24	125	3660	94	200
21	14	185	1020	26	55	30	18	150	4400	114	236
23	16	165	1260	32	68	30	24	125	4900	126	256
26	18	150	1650	42	90	34	30	100	6300	154	330
26	24	125	1840	47	100	39	39	75	8000	200	420
30	18	150	2200	57	118						
34	24	125	2450	62	128						
34	30	100	3150	77	165						
39	39	75	4000	100	210						

Various sizes of the single cylinder two stage type are also available.

Continued on Next Page

## VERTICAL TRIPLEX POWER PUMPS

The three following illustrations cover the most popular triplex power pumps made by Worthington.

Fig. 1693 is a general service pump suitable for clear liquid service up to 150 pounds pressure. It is a substantial, reliable general utility pump.

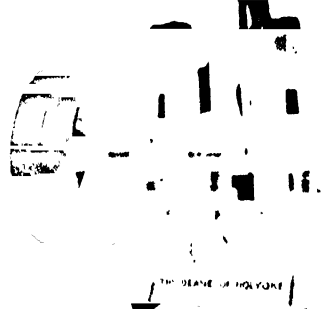


FIG. 1693, TRIPLEX POWER PUMP  
LIST OF SIZES SUITABLE FOR  
150 POUNDS PRESSURE

Size	Diameter of Plunger	Length of Stroke	Gallons per Rev.	Displacements		Ratio of Gearing
				Normal	Maximum	
3 x 4	4	12	50	12.5	17.5	1.5 to 1
4 x 6	6	12	50	12.5	17.5	1.5 to 1
6 x 6	6	12	50	12.5	17.5	1.5 to 1
7 x 6	6	12	50	12.5	17.5	1.5 to 1
8 x 6	6	12	50	12.5	17.5	1.5 to 1

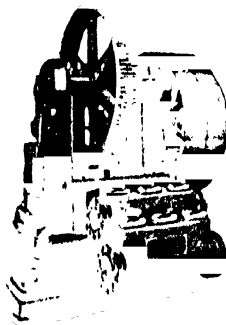


FIG. 2273, TRIPLEX  
POWER PUMP

LIST OF SIZES, FIG. 2273

Size	Diameter of Plunger	Length of Stroke	Max. Pressure	Gallons per Rev.	Displacements		Ratio of Gearing
					Normal	Maximum	
3 x 4	4	12	150	50	12.5	17.5	1.5 to 1
4 x 6	6	12	150	50	12.5	17.5	1.5 to 1
6 x 6	6	12	150	50	12.5	17.5	1.5 to 1
7 x 6	6	12	150	50	12.5	17.5	1.5 to 1
8 x 6	6	12	150	50	12.5	17.5	1.5 to 1

Fig. 2273 is popular where a machine of the highest grade is desired. In the design particular attention has been paid to the ease and economy of effecting repairs. It is a thoroughly high grade pump in every respect.

For high pressure work there are a number of machines made by Worthington similar to Fig. 1845. These pumps are made in a great number of sizes and are suitable for pressures up to 10,000 lbs. per square inch.

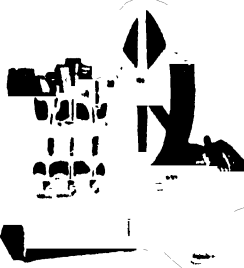


FIG. 1845, TRIPLEX POWER PUMP

## HORIZONTAL POWER PUMPS



HORIZONTAL POWER PUMP

Where a horizontal power pump is desired the machine illustrated is quite popular as a general service pump.

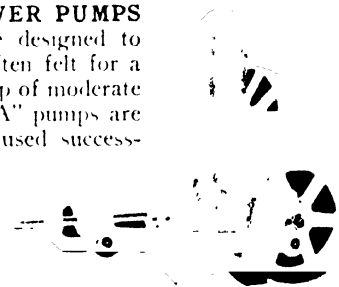
Other sizes and types are made in a line which covers pumps suitable for large and small capacities and pressures up to 10,000 pounds.

## SIZES AND CAPACITIES HORIZONTAL POWER PUMPS

Size	RPM	Normal		Maximum		Gear Ratio	Maximum Pressure
		RPM	GPM	RPM	GPM		
3 x 4	45	22	65	32	107	1	150
4 x 6	50	34	75	57	120	1	120
6 x 6	60	41	60	122	100	1	100
7 x 6	60	117	60	175	75	1	75
8 x 6	60	160	60	240	100	1	100
8 x 6	40	208	60	311	85	1	85
8 x 6	40	235	60	352	75	1	75

## MODEL "A" POWER PUMPS

These pumps are designed to meet the need so often felt for a simple, reliable pump of moderate first cost. Model "A" pumps are well built and are used successfully on general water supply, and any kind of cold clear liquid pumping where heads are most excessive.



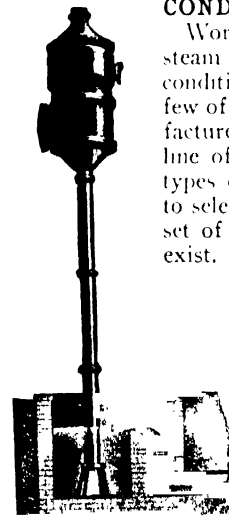
## MODEL "A" POWER PUMP

## LIST OF SIZES, CAPACITIES, ETC

Good for a lift or head of 175 ft. or 75 lbs. maximum pressure						
Diameter of Pistons	3	4	5	6	8	12
Length of Stroke	5	5	5	5	5	5
Gallons per Revolution	304	540	848	147	294	40
Revolutions per Minute	50	50	50	50	50	40
Gallons per Min. Piston Displacement	15	27	42	73	117	12
Pulley Diameter	12	16	16	20	24	24
Ratio of Gearing	5 to 1	5 to 1	5 to 1	5 to 1	5 to 1	5 to 1
Horse Power Required for Lift of 25 Ft.	3	5	7	13	20	20
Horse Power Required for Lift of 175 Ft.	15	23	35	62	100	100

## CONDENSING EQUIPMENT

Worthington is prepared to furnish steam condensing equipment for any conditions. The illustrations cover a few of the many different types manufactured. Having such a complete line of condensers of all the various types enables Worthington engineers to select the proper apparatus for any set of operating conditions that may exist.



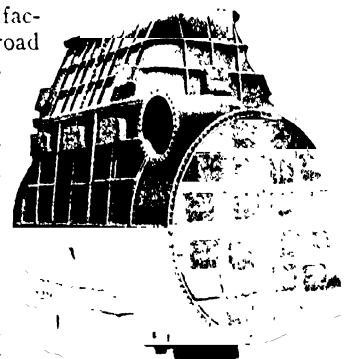
BAROMETRIC CONDENSER



SPIROJECTOR  
CONDENSER

Being pump manufacturers on such a broad scale enables this same type-selection idea to be carried out in determining what condenser auxiliaries will best suit the needs of the condenser selected.

Bulletin W-701 describes in further detail Worthington condensing machinery.



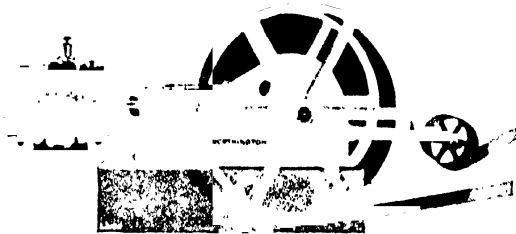
SURFACE CONDENSER

Continued on Next Page

# FEATHER VALVE AIR COMPRESSORS

(Reg. U. S. Pat. Off.)

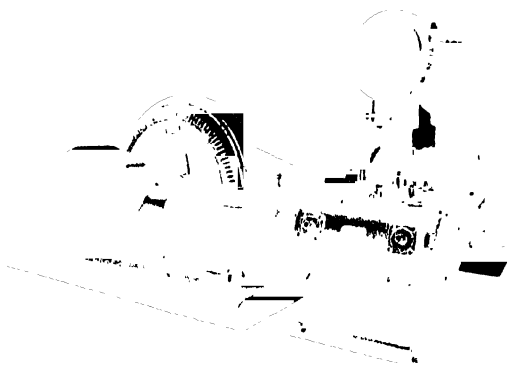
All the air compressors illustrated here are equipped with the patented Worthington Feather (Reg. U. S. Pat. Off.) Valve. This valve consists of a set of ribbon steel strips which, when seated, cover the ports in a flat valve seat. In opening each strip rises in the



SINGLE BELT DRIVEN FEATHER (Reg. U. S. Pat. Off.) VALVE COMPRESSOR

SIZES AND CAPACITIES, AIR COMPRESSORS  
Single Belt Driven      Single Steam Driven

Cylinder Diameter	Stroke	R. P. M.	Displacement	Air Pressure	Motor Horsepower	Steam Driven			
						Steam Cylinder	Air Cylinders	Stroke	R. P. M.
7 1/2	6	350	106	80-100	15-17	7	7 1/2	6	350
8 1/2	9	300	170	80-100	25-28	8 1/2	8 1/2	9	300
10	10	285	250	80-100	37-42	10	10	10	285
11	12	270	370	80-100	51-58	11	11	12	270
13	14	245	522	80-100	75-84	13	13	14	245
15	16	220	710	80-100	98-118	15	15	16	220
11	10	285	312	40-55	35-43	9	11	10	300
13	12	270	495	40-55	55-69	10	13	12	270
15	14	245	695	40-55	76-92	12	15	14	245
18	16	220	1090	40-55	112-136	14	18	16	210
12	9	300	335	20-30	28-35	8	12	9	315
13	10	285	435	20-30	35-45	9	13	10	300
15	12	270	660	20-30	54-69	10	15	12	312
18	14	245	1000	20-30	78-96	12	18	14	300
22	16	220	1540	20-30	116-146	14	22	16	235



TWO STAGE DIRECT CONNECTED MOTOR DRIVEN FEATHER (Reg. U. S. Pat. Off.) VALVE COMPRESSOR

Sizes and Capacities

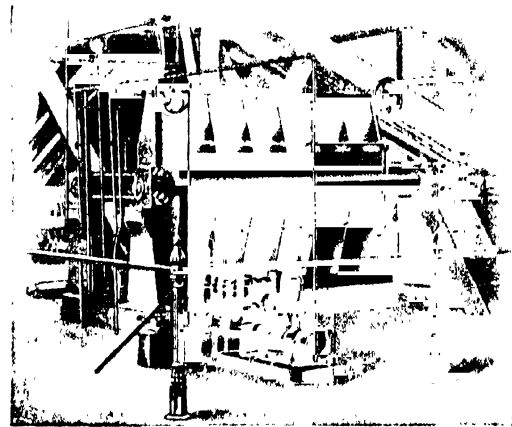
Size, Inches	Displacement	R. P. M.	Air Pressure	Motor Horsepower
13 & 8 x 10	455	300	80-100	72-81
15 & 9 1/2 x 12	670	277	80-100	108-121
18 & 11 x 14	1050	257	80-100	166-186
22 & 13 x 16	1570	225	80-100	235-265
24 & 14 x 18	1860	200	80-100	292-326
27 & 16 1/2 x 18	2350	200	80-100	347-390
27 & 16 1/2 x 21	2470	180	80-100	380-420
30 & 18 x 21	3050	180	80-100	475-530
27 & 16 1/2 x 24	2575	164	80-100	390-435
30 & 18 x 24	3200	164	80-100	500-560

center while the ends stay on the seat, the air passes around the strip. In seating the action is an even increase in the contact of the strip on the seat. The action is quiet and efficient. The valve does not slam on its seat, cannot chatter and wear is reduced to an absolute minimum.

These machines are made in a wide variety of sizes and types. Some typical sizes are given for air compressors. Gas Compressors for CO<sub>2</sub>, oxygen, natural gas and ammonia are also available in a large number of sizes and types. All are Feather (Reg. U. S. Pat. Off.) Valve equipped.

## FILTER PRESSES

Besides the filter press shown in the illustration, Worthington has acquired the patterns and rights of the filter press formerly built by the Platt Iron Works, Dayton, Ohio. These two complementary lines enable Worthington to select the proper press for any particular work under consideration. Worthington filter press service is therefore complete.



FILTER PRESS

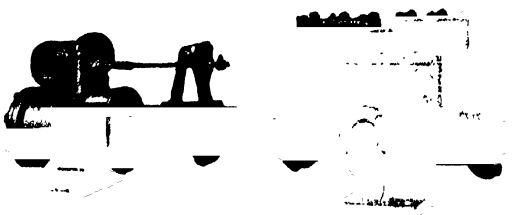
## FILTER PRESS PUMPS

Worthington has developed a line of pumps especially for filter press work. One pattern with list of sizes is shown.

These filter press pumps are fitted with ball valves and have liquid passages of generous dimensions. These features insure reliable operation when handling the semi-liquid substances found in filter press work.

SIZES AND CAPACITIES

Pump Sizes						Capacity per Stroke		Capacity per Minute	
Inches	mm.			Capacity per Stroke		Capacity per Minute		Capacity per Minute	
Steam Cylinder	Water Cylinder	Stroke	Steam Cylinder	Water Cylinder	Stroke	Gallons	Litres	Gallons	Litres
5 1/2	3	7	140	76	178	21	79	100	79
6 1/2	4	8	165	102	203	43	163	100	163
8	5	12	203	127	305	102	386	75	288
10	6	12	254	152	305	147	557	75	417
12	7	12	305	178	305	200	757	75	568



DIRECT-ACTING FILTER PRESS PUMP

# G. WOOLFORD WOOD TANK MANUFACTURING CO.

Established 1854

LINCOLN BUILDING, PHILADELPHIA, PA.

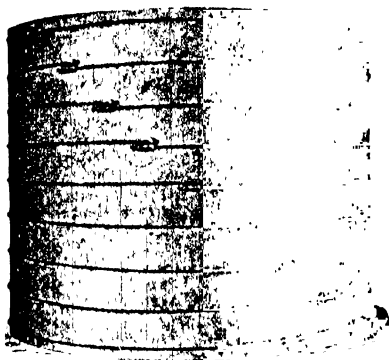
FACTORY DARBEE, PA.

## PRODUCTS

Wood Tanks, all shapes, all sizes, for all purposes, manufactured from best grades of all lumber. Silos for slate, lime, coal and agricultural purposes.

## FACILITIES

Our factory is completely equipped with all modern electrically driven wood working machinery, operated by skilled workmen. A large stock of thoroughly seasoned tank lumber in all the best grades insures quick delivery on quantity production. No tanks are too small or too large for our facilities and stock.



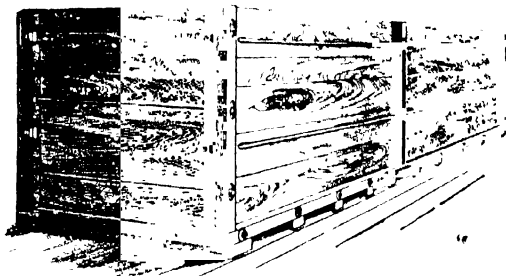
**ROUND WOOD TANK**

The best and most economical shape to use

## CONSTRUCTION

Machine made regular tanks, both circular and rectangular, eliminate variations and assure perfection of construction. All tanks hooped and braced commensurate with size and gravity of contents.

Requirements for tanks or tubs of irregular shapes and special features, or containers for the manufacture and storage of acid and other chemicals, the construction of which you are in doubt, should be submitted to our Technical Department for advice, cost, kind and grade of material and detail of construction. Expert workmen, specially trained, are employed exclusively upon this character of work.

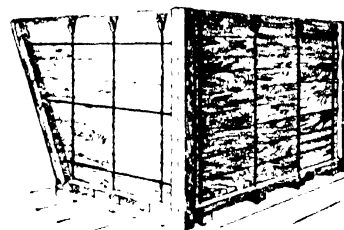


**RECTANGULAR TANK WITH RODS THROUGH WOOD**

Long tanks are braced at center

## ADVANTAGES OF WOOD TANKS FOR CONTAINERS

Low initial cost of installation. Your own men can assemble, as all parts are properly marked and numbered, low maintenance, non-conductors of heat or cold; non-corroding; made in any shape to fit any machinery, at minimum cost.



**RECTANGULAR TANKS WITH ALL RODS OUTSIDE OF WOOD**

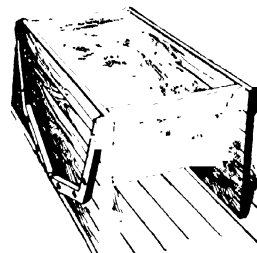
Any or all sides can be made sloping or straight

## SPECIAL TANKS FOR CHEMICAL INDUSTRIES

Tanks for chemical plants are a specialty with us. Give our tanks a trial wherever you have difficulty, or are in need of new ones. They have successfully replaced those of other materials and design in many large plants.



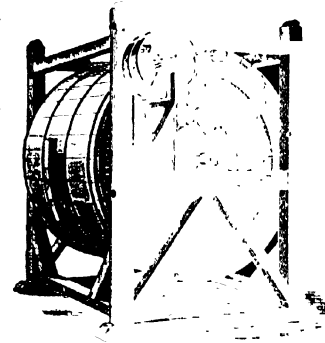
**ROUND TANKS CAN BE CLOSED AT TOP AND DIVIDED INTO AS MANY COMPARTMENTS AS NECESSARY**



**HALF ROUND TANK**

## LITERATURE AND ESTIMATES

Literature giving illustrations and detail of construction of tanks for every purpose supplied. Estimates of cost with or without installation, furnished on receipt of your specifications. Drawings will accompany estimates for special designs if desired.



**DRUM FOR MIXING OR WASHING**  
Can be driven with gears or sprocket chain





# WRIGHT-AUSTIN COMPANY

Manufacturers of Steam Specialties

DETROIT, MICH., U. S. A.

BRANCH OFFICES New York

Chicago

Boston

## PRODUCTS

Receiver Pumps; Steam Traps; Air Traps; Strainers; Catchalls, Steam Separators; Oil Separators; Vacuum Separators; Air Separators; Exhaust Heads; Water Columns for Boilers; Boiler Feed Regulators; Pump Governors.

## EXPERIENCE

Twenty-five years of designing, building and studying the every day problems of separation of moisture from steam and vapors under all manners of conditions and pressures, also oil from exhaust steam and vacuums, has given our engineering department a broad and practical experience. This department is always ready to discuss and cooperate with you on any steam, vapor, air or condensation problems.

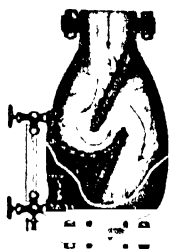


FIG. "A"  
Austin Live Steam Vertical  
Iron Separator

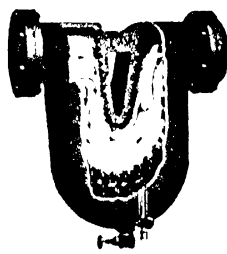


FIG. "B"  
Austin Live Steam Horizontal  
Iron Separator

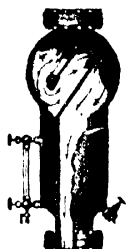


FIG. "M"  
Austin Live Steam Vertical  
Iron Receiver Separator

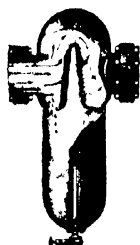


FIG. "E"  
Austin Live Steam Horizontal  
Iron Receiver Separator



FIG. "S"  
Austin Horizontal Self-  
Cleaning Oil Separator for  
Use on Exhaust Steam Lines

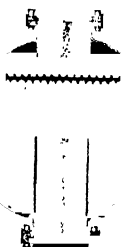


FIG. "R"  
Austin Vertical Oil  
Separator

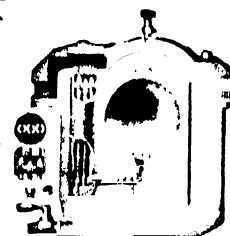
THESE FEW ILLUSTRATIONS SERVE TO SUGGEST THE VERY COMPLETE LINE OF AUSTIN STEAM AND OIL SEPARATORS IN REGULAR PATTERNS

There is an Austin Separator for every purpose.

## WRIGHT "EMERGENCY" 3-VALVE HIGH PRESSURE STEAM TRAP

Four great advantages in one simple compact trap

1. Adapted for any working pressure up to 200 lbs. without adjustment or change of parts
2. Enormous discharge capacity, provided by three valves
3. Automatically adjusts itself to any service.
4. Eliminates almost entirely the wear on the Monel Metal valves and seats.



WRIGHT "EMERGENCY"  
HIGH PRESSURE CON-  
TINUOUS FLOW  
STEAM TRAP

### DATA

Size No. of Trap	1	2	3	4	5	6	7	8
Size of inlet and outlet	3"	4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
Distance through in let and outlet	11 1/2"	12"	13 1/2"	13 1/2"	13 1/2"	16 1/2"	18"	19 1/2"
Height	19 1/2"	12"	13 1/2"	13 1/2"	13 1/2"	16 1/2"	17 1/2"	18 1/2"
Shipping weight, lbs.	70	100	120	140	160	220	260	320
List price	28.00	32.00	38.00	43.00	63.00	86.00	132.00	150.00

## CAPACITY OF WRIGHT 3-VALVE TRAP AT VARIOUS PRESSURES

Size Number	1	2	3	4	5	6	7	8
Pipe Size	3/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/4"	3"
Maximum discharge in pounds of water per hour at pressure of								
10 lbs.	2000	2400	3100	4000	5500	7000	11500	16100
20 lbs.	2500	3200	4000	5000	7000	10000	16500	22800
30 lbs.	2900	3700	4800	6000	8300	12100	20400	28000
40 lbs.	3200	4200	5300	6600	9000	13000	22500	31300
50 lbs.	3500	4600	5700	7100	9600	14000	24000	33800
75 lbs.	4000	5100	6400	8000	11000	17000	29200	41000
100 lbs.	4400	5600	7000	8700	12000	19000	32500	45900
125 lbs.	4700	6000	7500	9300	12500	20800	35300	49800
150 lbs.	4900	6300	8000	9900	13500	22400	38000	53700
175 lbs.	5100	6500	8300	10300	14000	23600	40700	57000
200 lbs.	5300	6700	8600	10700	14500	25000	43500	61500

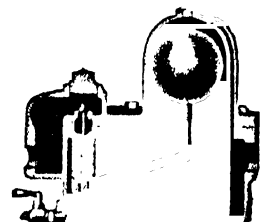
## WRIGHT "VICTOR" LOW PRESSURE STEAM TRAP

For pressures from 0 to 20 lbs.

Extreme simplicity and great capacity are dominant features

The Victor Trap has but three working parts, a round seamless copper float, one lever, one large valve.

This feature alone takes the bother and cost out of your trap maintenance.



WRIGHT "VICTOR" LOW  
PRESSURE AUTOMATIC  
CONTINUOUS FLOW  
STEAM TRAP

### DATA

Size Number of trap	Size of inlet and outlet	Distance inlet to outlet	Height of trap over all	Maximum discharge in pounds of water per hour at pressures of	Shipping weight	List price
				1 lb. 3 lb. 5 lb. 10 lb. 15 lb. 20 lb.		
0	1/2"	9 1/4"	9 1/4"	1125 1946 2500 3540 4340 5017	45	22.00
1	3/4"	12 3/4"	11 1/4"	2020 3494 4500 6360 7795 9000	70	28.00
2	1"	14"	12 1/2"	3040 5259 6770 9575 11735 13555	80	32.00
3	1 1/4"	15 1/2"	14 1/2"	3700 6400 8250 11650 14280 16500	100	38.00
4	1 1/2"	18 1/2"	15 1/4"	6880 11900 15340 21870 26555 30085	120	45.00
5	1 3/4"	19 1/2"	17 1/2"	9550 16520 21200 30080 36860 42500	160	68.00
6	2"	20"	19"	11400 19720 25420 35910 44000 50845	200	86.00
7	2 1/4"	25"	21"	14580 25220 32510 45920 56275 65025	255	132.00
8	2 3/4"	24"	22"	19920 34160 44420 62745 76860 88840	280	160.00

NOTE.—Every Trap carefully tested before leaving factory, and fully guaranteed.

# A. WYCKOFF & SON COMPANY

MANUFACTURERS OF

## Acidproof Wood Water Pipe

MAIN OFFICE AND FACTORY

ELMIRA, N. Y.

BRANCH OFFICES

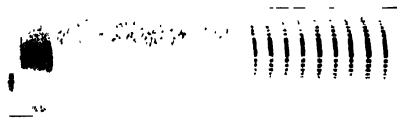
PITTSBURGH, PA.  
Johnson-Peter Co.,  
Pittsburgh Terminal Warehouse

SCRANTON, PA.  
Valley Supply Co.,  
Coal Exchange Building

ATLANTA, GA.  
H. H. White  
Fourth National Bank Building

### PRODUCTS

Machine Made Wood Stave Pipe for Water Works Systems, Power Plants, Paper Mills, Manufacturing Plants, Mines, Railroad Water Supplies and Chemical Plants. Also underground Wooden Steam Pipe Casings.



PARTLY COATED PIPE

Protective coating omitted from one half of wood pipe to show steel bands.

### USES

Wyckoff Wood Stave Pipe is adapted for use as follows: (1) When normal or constant pressure does not exceed 160 lbs. (2) For a supply main, from source of supply (3) For penstocks. (4) For carrying water highly charged with acids—mine water (hot and cold), mine culm, tan liquors, mineral spring waters; heavy fluids, pulps, brine, and gases in fertilizer works, paper mills or provision factories, also, diluted sulphuric, nitric, muriatic, acetic and tartaric acids.

It is made from selected Canadian pine. All staves are double tongued and grooved, with faces planed, under close inspection. Winding machine so arranged that staves are banded together or wound with a steel band, at desired uniform tension. Pipe is rendered watertight by tightly squeezing tongues into grooves. Maximum pipe lengths, 12 ft.; shorter sections permit pipes to be laid on curves, without iron fittings.

### SPECIAL ADVANTAGES

(1) Wyckoff Machine Made Wood Pipe is as durable as cast iron, and more durable than steel, is laid more cheaply than either and is as cheaply maintained; and will carry much more water, with equal diameter. (2) No skilled labor required to lay. (3) Narrow trench. (4) No electrolysis. (5) No corrosion by fumes and acids. (6) No destruction of pipe by sulphur or other impurities in minerals. (7) Fluids are not contaminated. (8) Elasticity of wood retards bursting. (9) Can be laid in wettest kind of trench. (10) Pipe unaffected by salt water. (11) Montezuma

asphalt coating, the best known protection to steel bands, is used exclusively.

### SIZES OF WYCKOFF WOOD PIPE

All sizes from 1 inch to 48 inches in diameter promptly supplied.

### DURABILITY OF WOOD PIPE

Wooden mains did efficient service in London, England, for over 63 years; in Philadelphia, Pa., and Burlington, N. J., for over 49 years; and in eastern cities of United States, for long periods of time.



SQUARE PIPE

Wyckoff Special Plain Square Wood Pipe bored from the solid white pine log for use in Tanneries and Chemical Plants.

### JOINT FITTINGS

For general purposes, special cast iron fittings are furnished, also to connect the wood pipe to cast iron pipe. Wooden crosses, tees and ells are made up to 10 inches in diameter, by properly boring heavy blocks cut from square timbers.

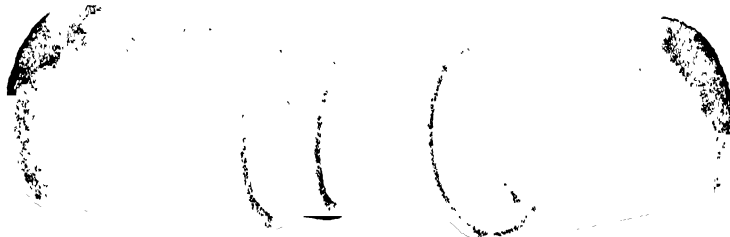
### COST OF LAYING WYCKOFF PIPE

Cost of furnishing and laying is about one-third the outlay for cast iron pipe. No special labor or materials needed in making joints. Its lightness permits laying the largest sizes without use of block and fall.

### WYCKOFF'S IMPROVED STEAM PIPE COVERING

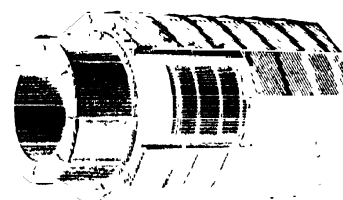
This covering is built of Cypress. The Wood Eternal. The inner shell of 2 inches and outer shell of 1 inch, with  $\frac{1}{4}$  inch dead air space between has proved to be the best known protection for underground steam and hot water pipes. The asphaltum packing placed between the shells on the ends of each length and the driven joint makes it watertight. The cut shows the covering before being coated with Montezuma Asphalt.

CATALOG AND PRICES FURNISHED ON REQUEST



TWO ENDS OF WOOD PIPE

Showing tenon and socket joints of Wood Pipe that will stand a pressure of 160 pounds per square inch by simply driving them together.



STEAM PIPE COVERING

# YARNALL-WARING COMPANY

Manufacturers of Yarway Steam Specialties

7611 QUEEN ST., CHESTNUT HILL

PHILADELPHIA

**YARWAY**

BRANCH OFFICES OR REPRESENTATIVES

Atlanta  
Boston  
Chicago  
Cincinnati

Cleveland  
Dallas  
Denver  
Detroit

El Paso  
Indianapolis  
Kansas City  
Minneapolis

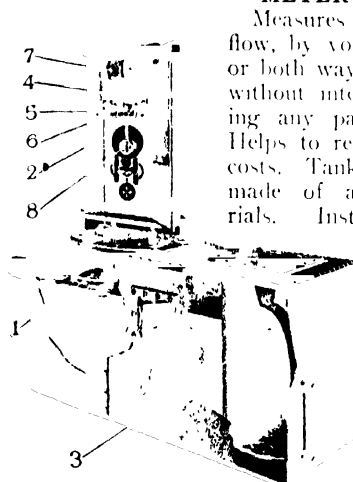
Montreal  
Syracuse  
New Orleans  
New York

Pittsburgh  
Richmond  
St. Louis  
San Francisco

## PRODUCTS

- Yarway-Lea V-Notch Recording Liquid Meter
- Yarway Adjustable Spray Head (C. C. Thomas Patents)
- Yarway Seatless Blow-Off Valve
- Yarway Double-Tightening Blow-Off Valve
- Yarway Pipe Joint Clamp
- Yarway Holtite Pipe Clamp
- Yarway Boiler Skimmer
- Yarway Hydraulic Valve (Caskey Patents)
- Yarway Starting and Pressure Unloader (Richards Patents)

### YARWAY-LEA V-NOTCH RECORDING LIQUID METER



Measures liquids while they flow, by volume or by weight, or both ways at the same time, without interrupting or retarding any part of the process. Helps to reduce manufacturing costs. Tanks and parts can be made of acid-resisting materials. Instrument may be equipped with a recording thermometer. Accurate within 1 1/2% at all rates of flow. Widely used in manufacturing processes of many industries, among which are:

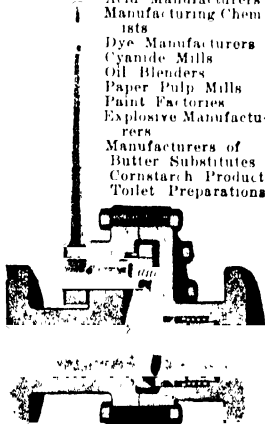
#### YARWAY-LEA RECORDING LIQUID METER

**Operation**—Float 1 raises or lowers rackrod 2, indicating on scale 4 height of liquid flowing over V-Notch 3. Drum 5 connected by pinion 6 with rackrod 2 indicates rate of flow at any moment in pounds or gallons per hour. 24-hour chart 7 records flow graphically. Cumulative readings are shown by integrator 8.

The Yarway-Lea V-Notch Meter has long been recognized as a standard for measurement of boiler feed-water. Thousands are in use in all parts of the world.

Send for Bulletin L-40, which gives complete details.

Acid Manufacturers  
Manufacturing Chemists  
Dye Manufacturers  
Cyanide Mills  
Oil Blenders  
Paper Pulp Mills  
Paint Factories  
Explosive Manufacturers  
Manufacturers of  
Butter Substitutes  
Cornstarch Products  
Toilet Preparations



YARWAY DOUBLE-TIGHTENING BLOW-OFF VALVE

### YARWAY ADJUSTABLE SPRAY HEAD (C. C. Thomas Patents)

A simple, efficient spray head for use on cooling ponds, or wherever a liquid must be cooled rapidly.

The only spray head that is adjustable to any rate of flow or pressure, and to varying atmospheric and temperature conditions.

Can be flushed clean by operating levers from shore.

Many successful installations throughout the world.

#### YARWAY SEATLESS BLOW-OFF VALVE

No seat to leak. No discs to wear out. Packing is stationary in body, is never exposed to force of blow-down, and is automatically tightened by closing hand wheel down hard. Slow opening—no danger of water-hammer. More than 20,000 sold.

**Operation** In closing valve, shoulder S on plunger V engages the loose follower gland F, compressing packing P above and below port, making an absolutely tight valve.

#### OTHER YARWAY PRODUCTS

**Yarway Double Tightening Blow-Off Valve**—A quick-opening valve with unique feature of sealing bushing on inlet side, making it double tightening on both sides of gate. Particularly adapted for use in tandem with Yarway Seatless Blow-Off Valve.

**Yarway Pipe Joint Clamp**—Permanently stops leaks at threaded pipe joints.

**Yarway Holtite Pipe Clamp**—Stops holes and splits in straight pipe.

**Yarway Boiler Skimmer**—A continuous, circulating surface blow, which prevents scale formation by continuously and automatically removing suspended foreign matter.

**Yarway Hydraulic Valve (Caskey Patents)**—A quick-acting pressure-packed valve for heavy duty.

**Yarway Starting and Pressure Unloader (Richards Patents)**—Increases efficiency and lowers current consumption of motor-driven air compressors. Prevents excessive temperature.

Prices and Details of Any Yarway Product on Request.



YARWAY ADJUSTABLE SPRAY HEAD



YARWAY SEATLESS BLOW-OFF VALVE

# YORK MANUFACTURING CO.

## Ice Making and Refrigerating Machinery Exclusively

MAIN OFFICE AND WORKS

YORK, PA.

BRANCH OFFICES

Boston, Mass., 75 Broad Street  
 Brooklyn, N. Y., 47th Street and Second Avenue  
 Philadelphia, Pa., 701 14th Street  
 Pittsburgh, Pa., 47 Terminal Way, S. S.  
 Cleveland, Ohio, 11900 Woodward Avenue  
 Atlanta, Ga., 116 1/2 Central Avenue  
 Chicago, Ill., 1117 1/2 Carroll Avenue  
 Omaha, Neb., 1213 1/2 Jackson Street

St. Louis, Mo., 117 1/2 South 11th Street  
 Denver, Colo., 2131 1/2 Market Street  
 Houston, Tex., 2001 Texas Avenue  
 New Orleans, La., 619 Baronne Street  
 Los Angeles, Cal., 108 Bond Street  
 San Francisco, Cal., 812 1/2 Tolson Street  
 Seattle, Wash., 508 Terry Avenue, North  
 Toronto, Can., Canadian Ice Machine Co., Ltd., Villiers & Munition Sts.

### PRODUCTS

Compression Refrigerating Machines, Absorption Refrigerating Machines, Ice Making Plants, Refrigerating Plants, Ammonia Valves, Acid Valves, Ammonia Fittings, Ammonia Condensers, Brine Coolers, Aqua Ammonia Pumps, Ice Cans, and all parts needed to equip a complete ice making or refrigerating plant.

### DESCRIPTION

We make, in our own factory, all the machinery and apparatus used in ice making and for general refrigeration, confining ourselves to the ammonia system, both compression and absorption types, and the CO<sub>2</sub> system.

### SIZES

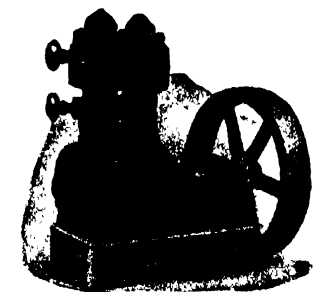
The enclosed machine is built in sizes from 1/8-ton refrigerating capacity upwards, the vertical single-acting machines from 20 to 600 tons, the horizontal double acting machines from 10 to 600 tons, either belt or steam driven type. Ammonia Absorption and Carbolic Anhydride (CO<sub>2</sub>) machinery of any capacity required by the trade.

### APPLICATION

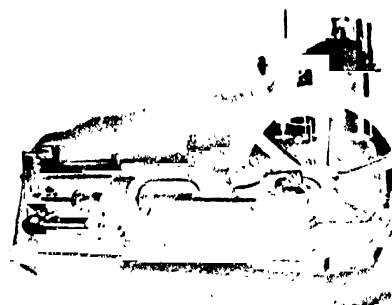
York Refrigerating Machines are adapted for use in Chemical Industries where low temperatures are required, the type of machine being determined, to a great extent, by local conditions.

### ACID VALVES

We make a thoroughly reliable Valve for use on Acid Piping—either Globe or Angle Style. In writing for prices state the nature of the acid and pressure to be carried.



VERTICAL SINGLE-ACTING ENCLOSED REFRIGERATING MACHINE



ENCLOSED SINGLE-ACTING REFRIGERATING MACHINE  
 Direct connected to Uniflow engine

Mechanical Refrigeration is our specialty. We do not claim to know all there is to be known or learned about this important subject, but what we do know we are willing to share with those who ask. If interested, put your problems up to our Engineering Department.



STANDARD VERTICAL SINGLE-ACTING REFRIGERATING MACHINE  
 Direct connected to Uniflow engine

### REFERENCES

A few York installations in the Chemical Field.  
 Eastman Kodak Co., Rochester, N. Y.  
 National Aniline & Chemical Co., Marcus Hook, Pa.  
 Niagara Alkali Co., Niagara Falls, N. Y.  
 Matheson Alkali Co., Saltville, Va.  
 E. I. Du Pont De Nemours & Co., Wilmington, Del.  
 General Chemical Co., Easton, Pa.  
 Atmospheric Nitrogen Corp., Solvay, N. Y.  
 Oldbury Electro-Chemical Co., Niagara Falls, N. Y.  
 Monsanto Chemical Works, St. Louis, Mo.  
 Parke-Davis & Co., Detroit, Mich.  
 Grasselli Chemical Co., Grasselli, N. J.  
 U. S. Government Nitrate Plant, Sheffield, Ala.

# ZAREMBA COMPANY

508 Niagara Life Building

BUFFALO, U. S. A.

NEW YORK OFFICE: 95 Liberty St.



## PRODUCTS

Horizontal Tube Evaporators  
Zarembo Patent Evaporators  
High Concentration Evaporators  
Rapid Circulation Evaporators  
Vertical Tube Evaporators  
Crystallizing Evaporators  
Hughes Foam Arrester  
Condensers  
Autoclaves and Leaching Cells  
Causticizing Apparatus

## ZAREMBA EVAPORATORS

Zarembo Evaporators are built for all classes of work other than the concentration of the heavy acids. The various sizes made represent capacities ranging from 150 to 15,000 gallons per hour. By having radically different types of construction from which to choose we can provide apparatus suited to any conditions that may obtain.

Zarembo Company has specialized in the construction of evaporators since the beginning of its career. The excellence of our apparatus is attested by the volume of repeat orders—over sixty per cent.

Zarembo Evaporators are in use throughout the United States and in all countries of the globe. "By their works you shall know them." Look up our record and remember that what we have done for others we can do for you.

## THE ZAREMBA PATENT EVAPORATOR

The design of this Evaporator is the result of long experience in every class of evaporator work and provides an all round excellence that cannot be secured otherwise.

The bodies are of cylindrical shape fitted with removable horizontal tubes secured in position by elastic gaskets and bolted packing plates.

**Advantages** *Maximum Work and Efficiency* is obtained from the steam because of

Rapid circulation of steam through tubes

Rapid circulation of liquor around the tubes

Complete venting of air and non condensable gases

No heat lost except by radiation, giving high efficiency

*Liquor* is discharged as wanted without injury or loss, because of

Low depth of liquor

Prevention of loss by entrainment

Ability to deliver product of high and uniform density

*Operative Features* are extremely economical because of

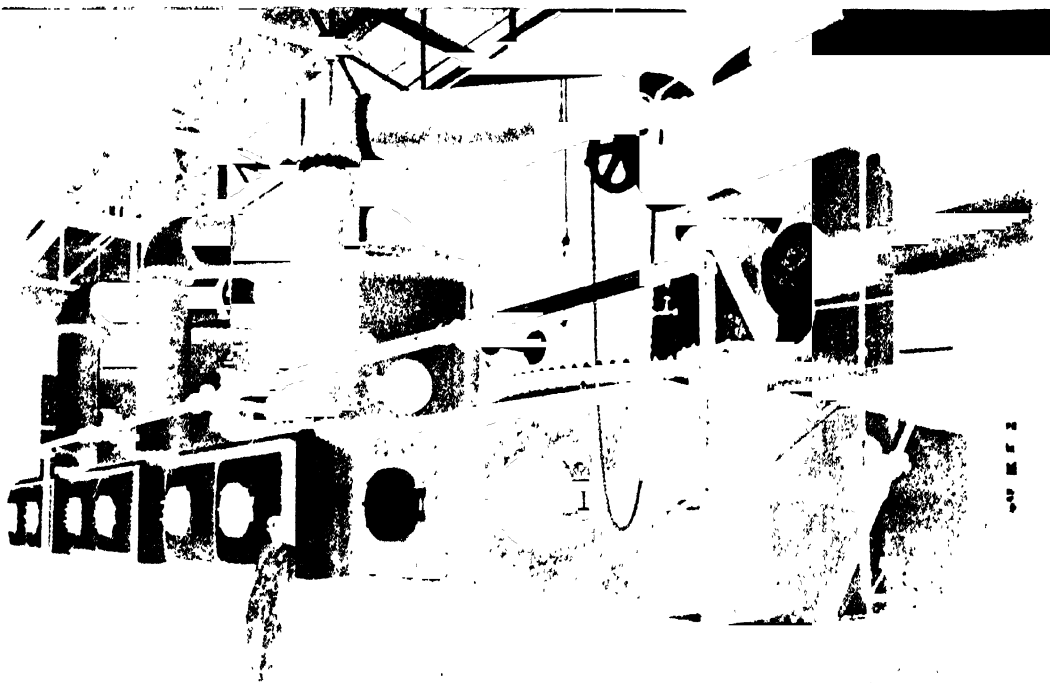
Perfect illumination of bodies

Ease of operation by cheap labor

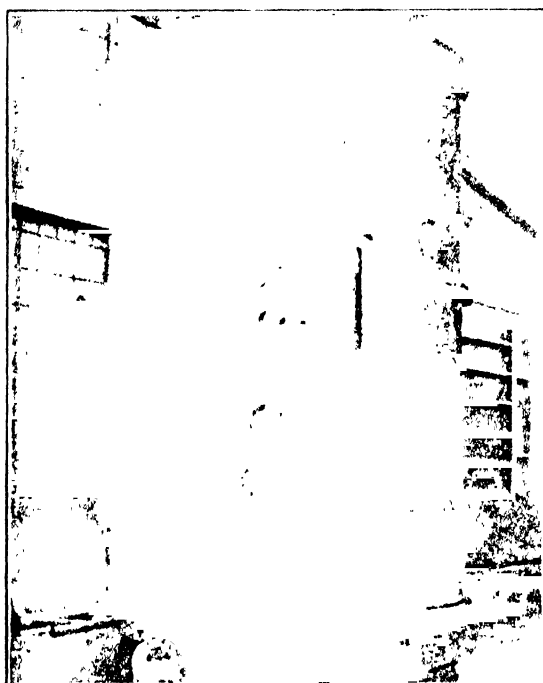
Uniform and strong scouring action on tubes

Ready accessibility to all parts of evaporator for cleaning

Economical operation at reduced capacity



ZAREMBA PATENT QUADRUPLE EFFECT FOR SULPHITE WASTE



HORIZONTAL TUBE FINISHING PAN

*Insurance Against Evaporator Trouble* provided because of —

Simplicity of construction — no moving parts

Ability to stand accidental internal pressure

Tubes easily removable by unskilled labor

Minimum number of joints, eliminating leakage

Ability to work under pressure — no special bracing used

Compact design prevents breakage from settling foundations

Each of the claims we make above has its special significance for the owner and can be readily verified by an analysis of our method of construction

#### THE ZAREMBA HIGH CONCENTRATOR

Provides means for carrying the concentration of liquids to a point far beyond the possibilities of all other evaporating apparatus. Heretofore the limit for caustic soda has been 45 to 50% solids, but by using this apparatus concentration can be continued readily to a content of 80% solids, solidifying on cooling

**Advantages** — Save cost of firing pots

Reduce wear to a minimum, because of low temperature used

Save freights on finished product by reducing water content to a minimum

Increase capacity of present evaporator by discharging its liquor at lower density

Increase capacity of dryers in old plants.

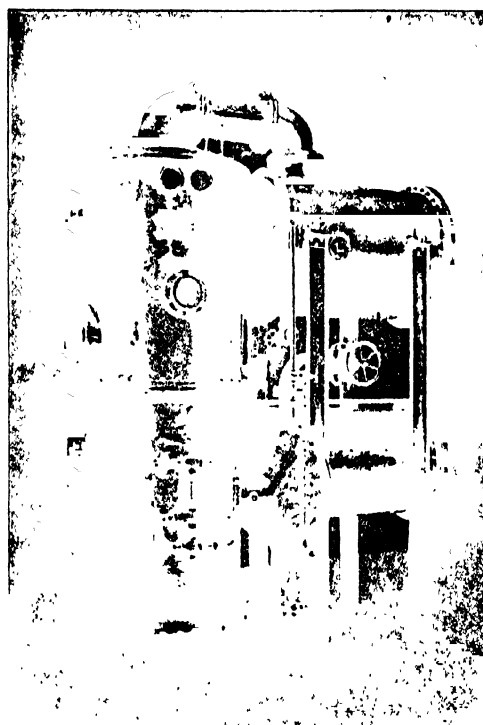
Reduce investment in dryers in new plants. “

Where incineration is to take place, increase combustibility by reducing amount of water left in the liquor.

#### THE ZAREMBA HIGH SPEED EVAPORATOR

Operates on the film system, and is designed for the concentration of liquids that tend to foam badly, for liquids demanding frequent mechanical cleaning of the tubes, for liquids that must be concentrated with minimum exposure to heat

The heating surface is carried in the lower projecting chamber, consisting of horizontal tubes. Steam is outside the tubes, boiling liquid and vapor inside. Operation is practically automatic, due to the use of a highly efficient liquor-level regulator



HIGH SPEED EVAPORATOR

**Advantages**—Amount of liquid exposed to heating surface reduced to minimum

Boiling surface is eliminated (all boiling occurs within the tubes)

All tubes accessible for cleaning by removing steam-chest cover

Construction of utmost simplicity.

Design exceedingly compact, requiring little space

#### HUGHES FOAM ARRESTER AND CENTRIFUGAL SEPARATOR

(Patent Applied For)

This recently perfected device effectively prevents loss by entrainment, splashing or foaming. It is the only separator which will arrest foam, consolidate it into liquid form and return to evaporator.

This device, used on evaporators concentrating foaming liquors, will also increase their capacity by making it possible to operate at full speed.

We are prepared to furnish centrifugal separators for use with existing evaporators of any make.

*Continued on Next Page*

**THE ZAREMBA CRYSTALLIZING EVAPORATOR**

Is a form of apparatus especially designed for the concentration of crystallizing solutions and the removal of the precipitated crystals without interfering with the process of evaporation.

Bodies are of cast iron, steel or copper. Tubes are of 2" charcoal iron or copper in vertical position, expanded into tube sheets. Steamchests are of the basket type and being independent of evaporator body and can be removed for replacement and repair.

**Advantages in Operation** Steam distribution in steamchests remarkably even, giving uniform ebullition over entire boiling surface. Every tube is in action all the time.

Entrainment losses prevented by the use of short tubes and efficient internal separators.

Interior of bodies perfectly visible, no excuse for careless operation.

High speed of liquor inside tubes retards incrustation.

Rapid separation of crystals from liquor secured by use of extra large downtakes and positive filter-press action at filter screens.

Salt discharged from filters thoroughly washed.

No centrifugals needed, thus greatly reducing cost of plant and cost of operation.

**Advantages in Design** Vapor piping arranged to isolate any one body for purpose of cleaning or repair.

Steamchests and connecting piping arranged to eliminate expansion strains, preventing leakage in steam and drain connections.

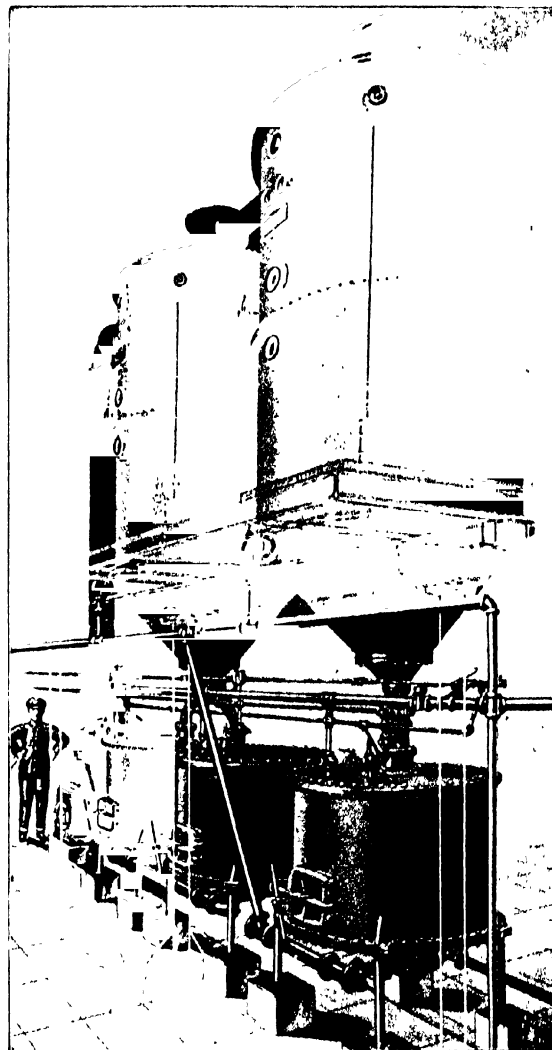
Tubes can be readily replaced.

Number of joints reduced to a minimum.

High pressures can be used with safety.

Steamchests can be removed easily and replaced.

Every feature fully worked out in practice.



DOUBLE-EFFECT CRYSTALLIZER

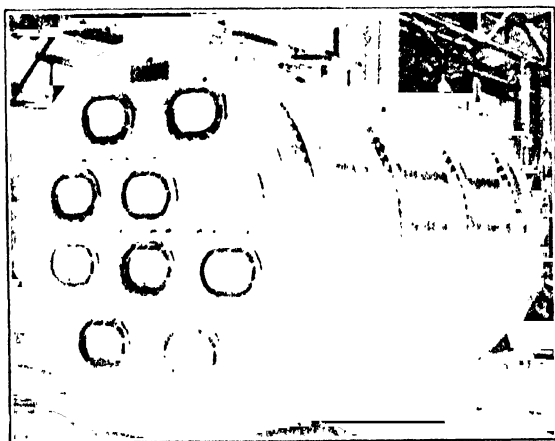


THE ZAREMBA CRYSTALLIZING EVAPORATOR

*Continued on Next Page*

### SURFACE CONDENSERS

Carefully designed to produce maximum heat transmission and effective air removal. Tubes are removable, being secured in place by rubber gaskets and bolted packing plates.



SURFACE CONDENSER

### PREHEATERS

When properly designed produce noticeable economy in steam. We have given this branch of the business much study. You should investigate.

### AUTOCLAVES, LEACHING CELLS, AND DIFFUSION BATTERIES

For the extraction of soluble compounds from solids, such as tanning extract from wood chips, soda from black ash, sugar juice from beets.

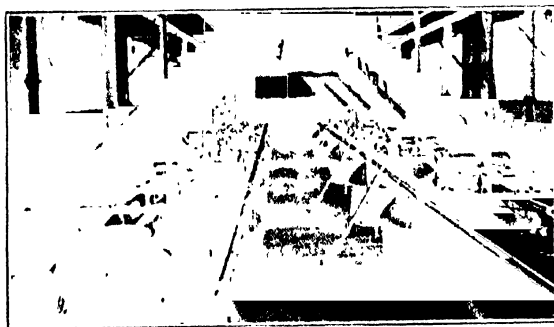


ILLUSTRATION SHOWS OPERATING DECK OF TWO 6-CELL BATTERIES FOR TANNING EXTRACT. CELLS ARE MADE OF STEEL WITH ACID PROOF TILE LINING

### ACID PROOF LININGS

Our system of acid proof linings, applied to iron or steel evaporator bodies, has proven itself a valuable and successful invention. By its use the cost of apparatus for concentrating liquors in acid condition is greatly reduced.

No difficulty is experienced in maintaining the linings intact. The method of construction is such that the linings must stay put.

### OUTSTANDING ACHIEVEMENTS

The largest Evaporator Plant in the United States and probably in the world, capacity 800,000 gallons per day, at Hopewell, Va.

The largest Electrolytic Caustic Evaporator Plant in the world, capacity 110 tons caustic per day, at Edgewood Arsenal.

The only thoroughly practical evaporator system for handling the tarry liquor produced in the distillation of hard wood.

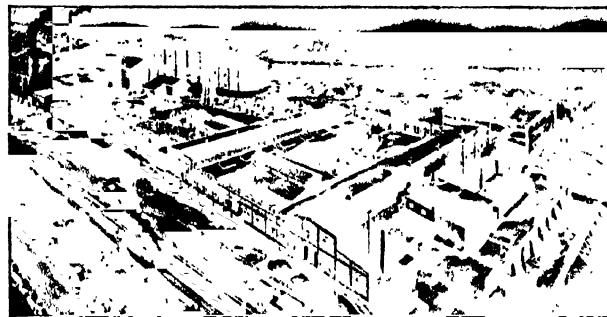
The Hughes Foam Arrestor, whereby it is possible to operate an evaporator to full capacity when handling excessively foamy liquors, such as jack pine black liquor.

A system of lining evaporators that is absolutely reliable.

The Zarembo Patent Evaporator, known throughout the country as being the simplest in construction and the most dependable in operation.

### MANUFACTURING FACILITIES

The success of Zarembo Company is in part due to the excellence of mechanical execution of its output. All our apparatus is built in thoroughly equipped shops prepared to handle work of the largest size. The high grade of castings that we furnish is a matter of frequent comment.



VIEW OF PLANT

In addition to our cast iron work, we do a large amount of construction in steel plate and in copper.

During the past eleven years we have made over 300 installations (comprising 600 evaporator bodies), many being of the largest size. The excellence of our work is attested by the volume of repeat orders, being over 60%.

### INQUIRIES

In submitting an evaporator problem to us, the conditions should be stated as completely as possible, since many considerations enter into the choice and lay-out of proper equipment.



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# Chemicals and Materials Section

Comprising catalog data of leading manufacturers of Heavy and Fine Chemicals, Reagents, Alcohols, Solvents, Dyestuffs, Dry Colors, Adhesives, Starches, Soaps, Sizings, Alloys, Raw Materials and Supplies used in the various industries to which the Chemical Engineering Catalog is distributed. Also of important handlers of Oils, Gums, Waxes, Ores, Rare Minerals, and other substances not marketed by manufacturers, and therefore admissible to this Section under the names of responsible dealers.

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Space in the Chemicals and Materials Section *is available only to manufacturers or their exclusive sales agents*, except in such lines as those last mentioned above, to which this regulation naturally does not apply. The restriction of this Section of the Catalog to *first hands exclusively* in manufacturing lines indicates the plane on which the work is conducted, and the character of the service rendered to the responsible, established makers of these commodities who are alone entitled to use space in the volume.

# Direct and Constant Contact with the Chemicals and Materials Market

More than eleven thousand copies of the Chemical Engineering Catalog are in the hands of the individuals who *actually buy and specify the materials used* in the industries employing chemical processes of manufacture, prominent among which are the following:

Pulp and Paper	Linoleum and Oilcloth
Sugar	Photographic Materials
Soap	Petroleum Products
Leather	Foodstuffs
Rubber	Glass and Pottery
Paint and Varnish	Drugs
Fertilizer	Perfumes
Textiles	Illuminating Gas
Cement	Flavoring Extracts
Paving Materials	Tanning Extracts
Dyestuffs	Fruit Juices and Syrups
Explosives	Disinfectants
Celluloid and other Plastics	Artificial Silk
Storage Batteries	Glue and Adhesives

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In addition to the Distribution List, space users in the Catalog are furnished with a Bulletin Service, which gives advance news regarding new enterprises and manufacturing changes and additions. This news comes direct to our Information Bureau and is, in most instances, exclusive information and profitable to our space users. The Bulletins are issued at irregular intervals, usually about every two weeks.

# ALBANY CHEMICAL COMPANY

Established 1881

Cable Address  
KFTONKST, Albany, N. Y.  
All Codes

Manufacturing Chemists  
Importers, Manufacturers' Agents, Exporters  
2-24 BROADWAY, ALBANY, N. Y.

FACTORIES  
ALBANY, N. Y.

NEW YORK OFFICE: 104 JOHN STREET

SOLE SELLING AGENTS FOR

QUINN LABORATORIES, INC.  
OLFAN, N. Y.

Manufacturers of  
Wood Creosote U. S. P.  
and Allied Products

PENN FORMALDEHYDE MFG. CO., INC.  
EAST SMITHPORT, PA.

Manufacturers of  
Formaldehyde  
and its By Products

THE EBOLITE COMPANY, INC.  
ALBANY, N. Y.

Manufacturers of  
Substitutes for  
Horn, Ivory, Amber, etc

## PRODUCTS

Chemicals  
Solvents  
Pharmaceuticals

## CHEMICALS AND SOLVENTS

Acetanilide, Technical  
Acetic Anhydride, 85% and 90%  
Acetone, C. P.  
Acetone Oil, Light  
Acetone Oil, Heavy  
Acid Acetic, All Grades  
Acid Citric, U. S. P.  
Acid Formic; 75, 85, 90%  
Acid Oxalic  
Acid Tartaric, U. S. P.  
Ammonia, Aqua, 26° B $\acute{e}$ .  
Amyl Acetate  
Aniline Oil  
Aniline Salt  
Chloroform, U. S. P.  
Collodion, Special Technical  
Collodion, Stripping  
Ether Sulphuric, U. S. P. 1910  
Ethyl Acetate, Technical  
Ethylmethyl Ketone  
Formaldehyde, U. S. P. 40%  
Fusel Oil, Refined (Amyl Alcohol)  
Iron Chloride Solution, Neutral  
Paraformaldehyde  
Solvent "T"  
Solvent "M"

## DYEWOOD EXTRACTS

Fustic, Extract  
Fustic, Solid  
Hematin, Crystals  
Hematin, Paste  
Logwood, Crystals  
Logwood, Extract Solid  
Logwood, Extract Liquid 51°

## SULPHONATED OILS

Excelsior Oil  
Turkey Red Oil

## PHARMACEUTICALS

Acetanilide, U. S. P.  
Acid Acetylsalicylic  
Acid Carboic, Crystals, U. S. P.  
Acid Citric, U. S. P.  
Acid Salicylic, U. S. P.  
Ammonium Iodide, U. S. P.  
Ammonium Citrate  
Ammonium Sulphocarbolate, U. S. P.  
Ammonium Salicylate, U. S. P.  
Cadmium Bromide  
Caffene Citrated, U. S. P.  
Calcium Sulphocarbolate  
Chloroform, U. S. P. For Anesthesia  
Collodion, U. S. P.  
Collodion, U. S. P. 1890  
Collodion, U. S. P. Flexible  
Cream of Tartar, U. S. P.  
Creosote, U. S. P.  
Creosote Carbonate, U. S. P.  
Cresolis Liquor Compositus  
Ether, Acetic, U. S. P.  
Ether, Nitrous, Conc., 1-21  
Ether, Sulphuric, U. S. P. For Anesthesia  
Ether, Sulphuric, Washed  
Guanacol Carbonate, U. S. P.  
Hexamethylenetetramine, U. S. P.  
Hydrogen Peroxide, U. S. P.  
Iodine, U. S. P., Resublimed  
Iodine Tincture  
Iodoform, U. S. P., Powder and Crystals  
Iron Chloride Crystals, U. S. P.  
Iron Citrate, U. S. P. VIII (Ferric Citrate)  
Iron Phosphate, U. S. P., Scales  
Iron Pyrophosphate, U. S. P. VIII, Scales  
Iron Sulphate, U. S. P., Crystals  
Iron and Ammonium Citrate, U. S. P., Brown Scales  
Iron and Ammonium Citrate, U. S. P., Green Scales  
Iron and Quinine Citrate, Soluble, U. S. P.  
Iron, Quinine and Strychnine Citrate  
Iron and Strychnine Citrate, U. S. P., VIII  
Methyl Salicylate, U. S. P.  
Paraformaldehyde  
Potassium Acetate, U. S. P.  
Potassium Citrate, U. S. P.  
Potassium Iodide, U. S. P.  
Salol, U. S. P.  
Silver Chloride  
Silver Iodide  
Silver Nitrate, U. S. P.  
Sodium Citrate, U. S. P. VIII  
Sodium Iodide, U. S. P.  
Sodium Salicylate, U. S. P.  
Sodium Sulphocarbolate  
Zinc Sulphocarbolate

# ALCOHOL PRODUCTS COMPANY

Independent Manufacturers of  
Acetates, Alcohols, Cotton Solutions, Lacquers, Etc

SALES OFFICE

110 WILLIAM STREET, NEW YORK, N. Y.

Cable Address  
"ALPRO", New York



PLANTS  
Newark, N. J.  
Sutton, W. Va.  
Monmouth Junction, N. J.  
Stamford, Vt

## PRODUCTS

Amyl Acetate

Butyl Acetate

Ethyl Acetate

Methyl Acetate

Amyl Alcohol

Butyl Alcohol

"Di-Al" (Diacetone Alcohol)

Fusel Oil, Crude

Soluble Cotton

Cotton Solutions

Split Leather Dope

Approved Airplane Wing Dope

Lacquers, Wood

Lacquers, Metal

Lacquers, Special

Patent Leather Solutions

Artificial Leather Solutions

Special Solvent Thinners

## SERVICE

Are you utilizing the services of our Research Department?

Consumers of solvents and cotton solutions will find this Department adequately equipped to satisfactorily

cope with their individual problems. Each of these men engaged in the Research Department is an expert in the manufacture and application of solvents and cotton solutions.

Let us assist you in successfully and economically meeting conditions which present themselves from time to time, and work with you in devising, developing, and perfecting formulas and new processes to meet your particular requirements as they may be affected directly or indirectly by buying and selling conditions.

Commencing with the mining of coal at mines which we control, the production of our solvents and cotton solutions is the culmination of a series of successive operations through the various steps involved in the manufacture of intermediates, and finally through to the finished products.

We stop here, however, and consequently are not competing with our customers.

The magnitude of our resources for crude materials from which most of our finished products are made, renders us independent of outside sources for our essential, crude and intermediate materials, assuring our customers of a steady and dependable source of supply.

The Brand "Alpro" means quality and service.

Inquiries should be addressed to New York Office.

# AMERICAN CYANAMID COMPANY



511 FIFTH AVENUE, NEW YORK, N. Y.

Cable Address  
"CYMENTRO", New York  
Western Union Code

Cyanamid Works, Niagara Falls, Canada

FACTORIES

Phosphate Mines, Brewster, Fla.

Ammo Phos. Works, Warners, N. J.

## PRODUCTS

Crude Cyanamid, Cyanamid, Cyanide, Hydrocyanic Acid (Liquid), Aqua Ammonia, Ammo-Phos, Mono-Ammonium Phosphate, Urea, Thiourea, Dicyandiamid, Florida Pebble Phosphate.

### CRUDE CYANAMID

The primary product of fixation of atmospheric nitrogen in calcium carbide at a white heat. From this product Cyanamid fertilizer, cyanide, ammonia, urea, dicyandiamid and a large number of organic nitrogen compounds are produced. It is a bluish black powder containing about 65% actual calcium cyanamid, equivalent to 22 to 24% nitrogen. Shipped usually in special tank cars, or in burlap bags.

### CYANAMID

A fertilizer material containing about 21% nitrogen, equivalent to 25% ammonia. Used only in manufacture of mixed fertilizers, at the rate of about 60 pounds per ton of mixture. Particularly useful as a drying agent or conditioner. The contained nitrogen is 97% water soluble, and organic in form.

### CYANIDE

An electric furnace cyanide made from crude cyanamid and common salt by simple fusion. Thousands of tons are used annually in the United States, Canada and Mexico for the reduction of gold and silver ores, and also for the manufacture of liquid hydrocyanic acid, prussiates, and metallic cyanides. The lowest priced source of cyanogen or cyanide for any metallurgical or chemical purpose. Thin, porous, dark gray flakes, readily soluble in water. Packed in metal drums containing about 200 pounds, net, each.

### HYDROCYANIC ACID (Liquid)

A water-white liquid, very pure, 95/98% HCN. Furnishes the greater part of the hydrocyanic acid used for direct fumigation of citrus fruit trees and vineyards in California. Also may be used for fumigating railroad cars, ships, mills, etc. Boiling-point 79° F. Packed in tin-lined drums, holding about 80 pounds each, net, or in steel cylinders. Shipped by motor truck from nearest point of production.

### AQUA AMMONIA

26-degrees Baumé, containing 29.4% ammonia, absolutely free from coal-tar impurities. Made at Ammo-Phos Works, Warners, New Jersey.

### AMMO-PHOS

An ammoniated phosphate, used principally as a highly concentrated fertilizer. One grade contains 13% ammonia with 48% available phosphoric acid. Another grade contains 20% ammonia with 20% available phosphoric acid. Each ton contains as much plant food as two to three tons of other high-

grade fertilizers, thus saving one-half to two-thirds the cost of freight, bags, handling, etc., on a given amount of plant food. The product is dry, granular, perfectly stable, and over 95% water-soluble. Particularly valuable for export. Packed in burlap bags holding 200 pounds, net, each.

### MONO-AMMONIUM PHOSPHATE

Mono-ammonium phosphate ( $\text{NH}_4\text{H}_2\text{PO}_4$ ), technical or chemically pure grades. Used for fireproofing, impregnation of matches, yeast culture, and in baking powders.

### UREA

Melting-point 132.65°C. Used as an anti-acid or stabilizer in pyroxylin plastics, such as celluloid, in lacquers, artificial leather, dopes, etc. It is perfectly neutral but reacts with any traces of acid developed by slow decomposition on long standing, thus tending to prolong the life, color and strength of the substance in which it is used.

### THIOUREA

$\text{CS}:(\text{NH}_2)_2$ . A new commercial product, melting-point 180° C. Can be produced on large scale. Possibly useful in accelerators for vulcanizing rubber.

### DICYANDIAMID

A white crystalline salt. Melting-point 205° C. Formula— $\text{NH}_2\text{C}(\text{NH}_2)\text{NHCN}$ , 66% nitrogen. An organic base for guanidine compounds and possibly several other valuable compounds. Research on this product may uncover some valuable industrial uses. Can be produced at low cost in large quantities.

### FLORIDA PEBBLE PHOSPHATE, 68%

Capacity of mines, at Brewster, Florida, over 700,000 tons per annum.

### PROCESS RIGHTS

Process rights and basic material (crude cyanamid) for production on large scale of

Aqua Ammonia  
Anhydrous Ammonia  
Nitric Oxide  
Nitric Acid  
Ammonium Nitrate

### BOOKLETS

Descriptive matter on any or all products sent on request.

### POLICY

All Aero Brand products are manufactured on a basis of large scale operation by improved processes, from fundamentally low-costing primary materials. It is the policy of the company to share with consumers the economies resulting from its fundamental processes, in order to encourage the widest possible use of Aero Brand products.

# AMERICAN DYEWOOD COMPANY

80 MAIDEN LANE, NEW YORK, N. Y.

Cable Address  
"DYEWOOD," New York

115 Bourse Building, Philadelphia, Pa.

BRANCH OFFICES  
115 High Street, Boston, Mass.

516 Spectator Building, Hamilton, Ont.

## PRODUCTS

Dyewood Extracts for dyeing and coloring wool, cotton, silk, leather, wood, paper, and other materials.

## LOGWOOD EXTRACTS

Liquid, Solid and Crystals.

## HEMATINE

Paste and Crystals.

## FUSTIC EXTRACTS

Liquid, Solid and Crystals.

## HYPERNIC, LIMAWOOD AND REDWOOD EXTRACTS

Liquid, Solid and Crystals.

## GROUND AND CHIPPED DYEWOODS

Including Logwood, Fustic, Hypernic, Limawood, Camwood, Barwood and Red Sanders.

## EXTRACT QUERCITRON BARK

## OSAGE ORANGE EXTRACT

## YOUNG FUSTIC CRYSTALS

## CUTCH EXTRACT

## GAMBIER PASTE

## GROUND TARTAR

## GROUND TURMERIC

We also handle extensively:

## NATURAL INDIGO

## EXTRACT SUMAC

Liquid and Crystals.

## ARCHIL

## EXTRACT OF INDIGO

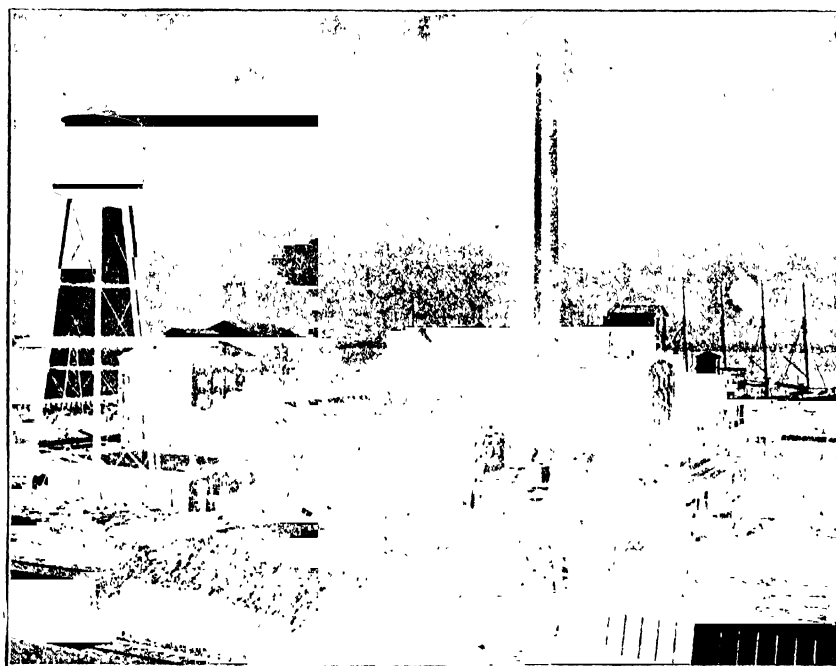
## COLORS AND CHEMICALS

## HISTORY

A continuous business since the year 1798.

Over a century ago our original predecessors established this business, laying a firm foundation of service and quality that has endured.

From an original beginning at Greenwich Village in 1798, where the power was furnished by a horse walking around a capstan, and the very smallest production, the Company gradually developed, until the establishment was moved to Greenpoint, Brooklyn, where the business was incorporated as the New York Dyewood Extract & Chemical Company, succeeded by the New York & Boston Dyewood Company, which, by consolidation with the Sharpless Dyewood Extract Company of Pennsylvania, in 1904, created the present Company, whose plant is now situated at Chester, Pa., with an output capacity of some 65,000 tons per year, thus making it the largest individual dyewood mill in the world.



WORKS AT CHESTER, PA.

# AMERICAN MINERAL PRODUCTS & COLOR CO., LTD.

## NOBELSTOWN (NEAR PITTSBURGH), PA.

### PRODUCTS

Sun Oxide of Iron, Prepared Mineral Oxide-Sponge; Non-Carbonaceous and Fireproof Mineral Sponge—the perfect Fluffing Material; Basic Ferric Sulphate, a fertilizer.

### SUN OXIDE OF IRON

This product is used as the absorption medium in the purification of city gas during manufacture.

The method of use consists in uniformly mixing this oxide of iron with granulated blast furnace slag, the latter acting as a fluffing material or "body" for the oxide. Sufficient water is added to this mixture to produce a colloidal mass. The whole is then loaded into the gas-boxes as in present practice in gas works, and the gas filtered to free it from sulphur.

The advantages attendant upon using such a fluffing material are many, such as: Greater purifying capacity, reduction in cost of purifying gas. It is Non-Combustible.

The sulphur from the purified gas forms sulphur pyrites with components of the slag.

### OTHER OXIDES OF IRON

Other Oxides of Iron are made by us for paints, rubber, linoleum, wall-paper, and similar requirements; also a brilliant red, known as "high oxide," equal to the best imported English Oxide for every use to which the latter is put.

### BASIC FERRIC SULPHATE $\text{Fe}_2\text{O}(\text{SO}_4)_3$

This product recovered from flue dust as a by-product is refined by us and is an excellent fertilizer. The analysis is as follows:

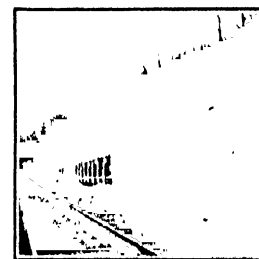
Basic Ferric Sulphate	41.55
Ca O	21.83
P	0.070
Si O <sub>2</sub>	19.45
Moisture (at 100% C)	5.97
Combined H <sub>2</sub> O	5.77
Sulphuric Acid	.98
Aluminum	6.05
	101.67

### ABSORPTION TEST OF SUN OXIDE OF IRON BY THE KUN-BERGER METHOD USED BY THE U. G. I.

Sample	moistened before fouling	figured dry	
Mar	13th, First fouling	26.7	per cent
"	14th, Second fouling	20.0	"
"	17th, Moisture added		
"	18th, Third fouling	22.3	"
"	20th, Fourth fouling	20.0	"
"	22nd, Moisture added		
"	25th, Fifth fouling	24.9	"
"	27th, Sixth fouling	16.7	"
Mar	31st, Moisture added		
April	1st, Seventh fouling	13.1	"
	Sample removed from tube, moistened occasionally and allowed to dry in the air		
April	16th, Eighth fouling	21.0	"
"	17th, Moisture added		
"	19th, Ninth fouling	26.0	"
"	23rd, Tenth fouling	26.2	"
"	24th, Removed from tube, moistened and aired		
"	25th, Eleventh fouling	24.6	"
"	28th, Twelfth fouling	24.4	"
"	29th, Removed from tube, moistened and aired		
"	30th, Thirteenth fouling	24.4	"
May	2nd, Fourteenth fouling	24.6	"
"	5th, Fifteenth fouling	25.6	"
"	10th, Sixteenth fouling	26.7	"
"	23rd, Seventeenth fouling	23.1	"
"	27th, Eighteenth fouling	22.5	"
"	28th, Removed from tube, moistened and aired		
June	1st, Nineteenth fouling	22.1	"
"	11th, Twentieth fouling	21.8	"
	Total	456.7	"



OXIDE OF IRON DEPOSIT  
20 FT. THICK

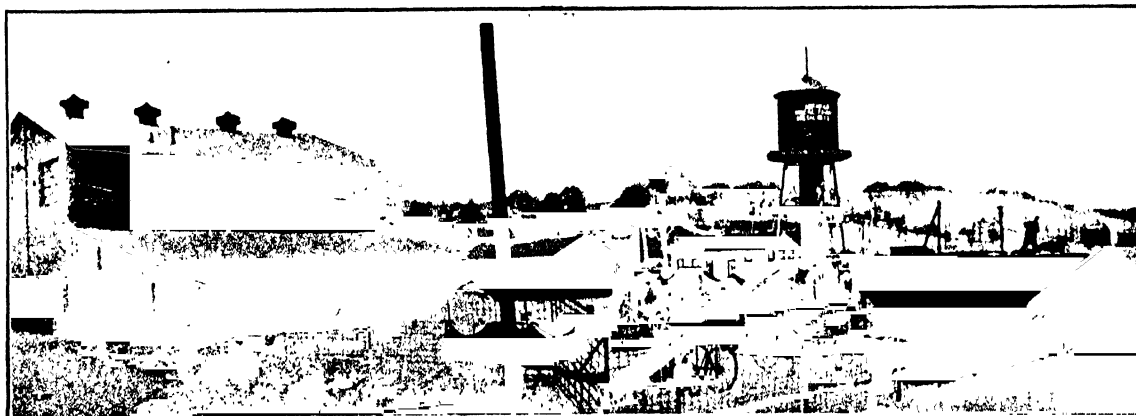


LOADING TIPPIE AT SUN  
OXIDE PLANT

### "GRANULATED" SLAG USED FOR WATER PURIFICATION TO PREVENT STREAM POLLUTION

This slag is made by a process patented by us. It is when finished a brittle, pumice-like mass. It has substantially all its original lime content. It is used to form a filter bed, through which coal mine water containing acids is run. In neutralizing a hydrated sesqui-oxide of iron is formed.

The spent slag is excellent as a fertilizer, for purifying gas, and for paint manufacture.



HOME OF SUN OXIDE AND PREPARED MINERAL SPONGE AT NOBELSTOWN, PA.

# AMERICAN STEEL & WIRE COMPANY

CHICAGO, ILL.

NEW YORK, N. Y.

CLEVELAND, O.

PITTSBURGH, PA.

DENVER, COLO.

EXPORT REPRESENTATIVE

U. S. STEEL PRODUCTS CO., 30 CHURCH ST., NEW YORK, N. Y.

Cable Address: "STEELMAKER", New York

PACIFIC COAST REPRESENTATIVE

U. S. STEEL PRODUCTS CO.

San Francisco, Calif.

Los Angeles, Calif.

Portland, Ore.

Seattle, Wash.

## PRODUCT

### American Sulphate of Iron

Sugar Form

Prime Green Crystal

## AMERICAN SULPHATE OF IRON

With us this is a by-product of quality, and the word quality used here has a deep significance.

Through a period of years there has been an evolution in the processes of production. We have the largest equipment to turn out the greatest quantity and the best quality obtainable, free from excess acid and moisture, and of uniform composition.

Several of the applications of Sulphate of Iron are:

1. Water Purification: As a coagulant.
2. Red oxide production, by burning
  - a. To produce colors and pigments
  - b. For plate glass polishing
  - c. For jewelers' rouge
3. Prussiate of Soda, obtained from iron cyanides produced as a cyanogen by-product of gas-plants and coke-ovens to make hydrated iron oxide for use in purifying boxes of gas plants.
4. Gas Purification, by combination with prussiate of soda and acids, subsequently used to produce,
  - a. Blue pigments.
  - b. Printing ink
  - c. Bluing
5. Prussian Blues,
  - a. In dyeing with natural wood dyes on silk, wool, cotton and leather
  - b. In paper and cardboard manufacture
6. As a mordant,
7. Recrystallized chemically pure Sulphate of Iron, useful in the following lines:
  - a. Fur dyeing
  - b. Photographic work
  - c. Analytical chemistry
8. Concentrated tankage, setting the "stick" from the liquor.
9. Fertilizer ingredient
10. Radium and vanadium production, in concentration of rare earths
11. Precipitating gold in jewelers' industry.
12. Stock foods and disinfectants
13. Drugs and medicines
14. Weed eradication and horticultural purposes
15. Hog conditioner and prophylactic of hog cholera.
16. Deodorizer in farm and camp sanitation

These may suggest to you a use that you can make of Sulphate of Iron.

On request a sample will be furnished with which you can experiment or determine its analysis.

Hitherto you may have known this product as Copperas and may have given no serious consideration to its use in your work. However the fairly comprehensive list of its applications will now indicate to you the variety of industries in which American Sulphate of Iron is used.

The progress of "Made in America" chemicals has been remarkable. We have kept step in this march onward and are prepared to serve this quality product.

## SPECIFICATIONS

Ferrous sulphate, Green vitriol, Copperas.

$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ .

**Color and properties**—Pale bluish-green crystals of various sizes and shapes; efflorescing in air; saline, astringent taste.

**Physical constants**—Molecular weight 278; specific gravity 1.8987 (15° C.); melting-point: Dissolves in its water of crystallization at 64° C.; loses its water of crystallization entirely at 300° C., or  $6\text{H}_2\text{O}$  at 100° C.

**Solubility**—Parts in 100 of water:

At 0° C. 32.8; at 60° C. 263.

Insoluble in alcohol.

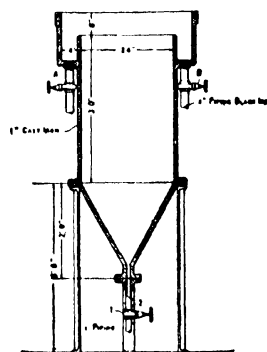
**Grades**—(a) Prime Green Sulphate (Selects or Stick crystals) is the commercial Sulphate in crystals of relatively large size. It results from the natural process of crystallization. Where this grade is desired, we use care in selecting only crystals of prime quality.

(b) Seconds (Bottoms) is a somewhat poorer quality of mixed crystals, sometimes termed "Rusty."

(c) Sugar Sulphate is the newer form of Sulphate of Iron in which we specialize. It is produced in crystals of uniform size resembling coarse grained granulated sugar. Its Anhydrous Sulphate content runs approximately 7.36% greater than the Prime Green and 12.18% greater than Seconds, which makes it a more economical purchase where strong iron or acid content is required. It will not agglomerate into lumps if kept in a cool, dry place.

### Method of Dissolving Sugar Sulphate of Iron—

The proper method for dissolving Sugar Sulphate of Iron is as follows: Place the Sulphate in the dissolving tank such as shown. By opening the valve "2," water is forced upwardly through it, overflowing the vessel at the top and can be conducted away to storage through valves "A" or "B". A saturated solution can be prepared with a single flow and within a few seconds.



DISSOLVING TANK

## FORM OF SHIPMENT

Sulphate of Iron is shipped in bulk and in three styles of packages: 200 lb. bags; 100 lb. bags; and barrels weighing approximately 350-400 lb. each.

## SERVICES

Our Water Purification, Agricultural, and Sanitary Engineering staffs are always available free, and we shall be glad to have you make the fullest possible use of their knowledge and experience.



# AMERICAN TRONA CORPORATION

Borax and Potash Producers

THIRTY-SIXTH FLOOR, WOOLWORTH BLDG., NEW YORK, N. Y.

WESTERN OFFICE Pantages Building, LOS ANGELES, CALIF.

Deposit and Refinery  
Trona, Calif

Cable Address  
"AMERTRONA", New York

## PRODUCTS

Borax  
Potash

### BORAX

"Three Elephant Brand" Borax, granulated and powdered, is guaranteed to be 99.5% pure

**Uses**—Borax is used extensively in the ceramic industries, glass, enameled ware, pottery, etc., in metallurgy as a flux; in the textile industry, in tanning for preserving, bleaching and softening leathers, also with hemlock tans. It is also used extensively in medicine; in toilet preparations such as hair washes, tooth pastes, cosmetics, and mouth washes, antiseptics and disinfectants, also as a food preservative.

**Shipments**—For the convenience of our customers we carry extensive stocks of Borax at convenient trade centers.

Shipments of carload lots in bulk or in bags or barrels can be made immediately from our factory or distributing points.

### POTASSIUM CHLORIDE (Muriate of Potash)

"Kemfert" brand of Potassium Salts are produced by us in grades containing from 80% to 98% KCl, or 50% to 62%  $K_2O$ .

**Analysis**—"Kemfert" Potash Salts

$Na_2B_4O_7$ .....	0.47%
$NaHCO_3$ } .....	0.52
$Na_2CO_3$ }	
NaCl .....	0.58
$Na_2SO_4$ .....	0.38
KCl .....	98.10
Total .....	100.05

**Uses**—"Kemfert" Potassium Salts are suitable for all Chemical and Fertilizer purposes. Practically all the Caustic Potash produced in the United States during the last two years was manufactured from our Potash Salts. Other important uses are the production of Potassium Chlorate and the manufacture of Dyestuffs.

**Shipments**—Carload lots in bulk in paper-lined cars, minimum weight 40 tons, can be made immediately. Shipments in bags or barrels in specified sizes can be arranged.

## COOPERATION

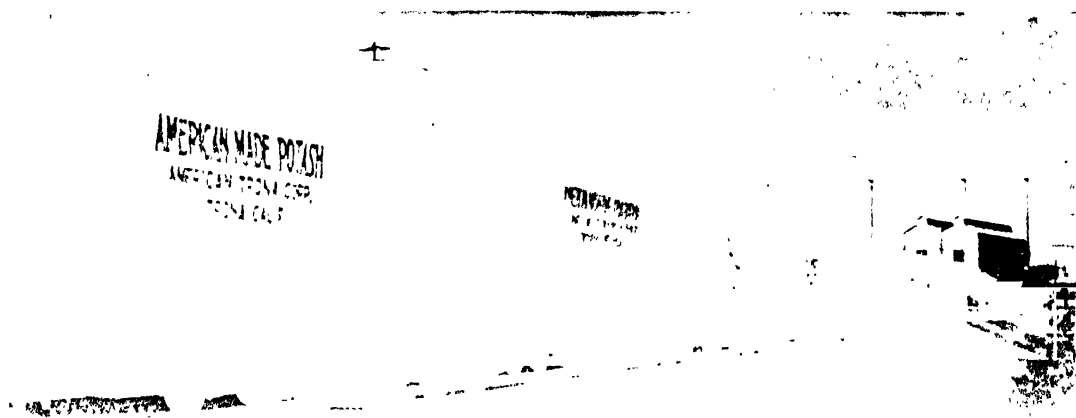
Our technical staff stands ready at all times to render any assistance desired in connection with the use of our products, to smooth out difficulties, solve problems, and standardize processes.

## QUOTATIONS

We shall be pleased to quote promptly on any amount of our products.

## SERVICE

Every man in our organization is trained in the knowledge that quick shipments and dependable deliveries are vital factors in the industries we serve. Our location on our own railroad connecting with transcontinental trunk lines means an adequate car supply with quick rail movement to the Middle Atlantic and Southern States. Rigid chemical control insures constant maintenance of quality—a guarantee to our customers of absolutely trustworthy service.



PART OF A SINGLE SHIPMENT OF 32 CARS OF KEMFERT SALTS, AVERAGING 91% KCl

# APEX CHEMICAL COMPANY, INC.

Manufacturers of Industrial Chemical Products

Cable Address  
APEXICAL, New York  
ABC Code

223 WEST 33RD STREET, NEW YORK, N. Y.

WORKS

200 14 S. First St., Elizabethport, N. J.

BRANCH  
775 Draxel Bldg.  
Philadelphia, Pa.

## PRODUCTS

Chemicals for the Textile, Tanning, Rubber, Printing Ink, Fur Dyeing, and Allied Industries.

### ANTIMONELLE (Patented)

A fixing agent for basic colors and for the manufacture of fast color lakes. Twice the strength of tartar emetic; produces better results at less cost.

### ANTIMONY LACTATE

Both liquid and dry. A fixing agent for basic colors; suitable for textile and leather requirements.

### ANTIMONY SULFURET

Crimson and Golden. Applied in the manufacture of rubber.

### CALAFENE

A binder for pigments on leather. Assures a fast pigment and pliability. Reduces the cost of pigment solution.

### CARSENE

Removes grease and other stains from textile fabrics; prevents "spewing" of leather. Non-inflammable.

### CHROMIUM FLUORIDE

Crystal form. Used in printing paste, in wool printing, for fastening the colors. No free mineral acid.

### DEPILOMINE

Removes the hair from hides and skins without the liming process. Non-injurious to the hide substance. A two-day process; saves time and labor.

### FATOSAN

A highly concentrated, refined fat liquor for leather. Particularly intended for leather that is to be glazed finished. Perfectly soluble and neutral.

### FINISHES

For all kinds of silk, silk and cotton mixed, and cotton fabrics. Finishes to meet special requirements.

### LACTIC ACID (Commercial)

22%, 44% and 66% strengths. Lightest in color and purest in quality. For tanning of leather and wool dyeing, and other purposes. The 66% strength is recommended because of the saving in freight, cartage and handling, due to its concentrated strength.

### LEATHER DRESSINGS

To produce high, medium or dull finishes to leather. Smutproof and flexible. Of special advantage in connection with pigments. Dressings to meet special requirements.

### OILS

Modern equipped plant for sulfonating oils.

**Turkey Red Oil**—All strengths; perfectly soluble.

**Ronopole Oil**—Similar to Turkey Red Oil but more highly oxidized and possesses superior properties. Better for dyeing and finishing of textiles.

**Chlorinol Oil**—A solvent oil for scouring wool. Removes mineral oil and other stains and impurities.

**Emulsive Oil**—For softening raw silk prior to winding. Imparts "body" to the raw silk, because of its high specific gravity. Will not affect the gum or silk fiber.

**Lubricating Oil**—For "lubricating" or softening artificial silk yarn intended for knitting purposes. Readily removed in the dyeing process; eliminates streaky or uneven dyeing.

**Yolk Oil**—For treating fur pelts after dyeing, in place of egg yolk. Imparts a soft, velvety effect and nourishes the pelt; will not affect the pelt. One pound displaces ten pounds of egg yolk, thus assuring a lower cost.

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For brightening and fastening colors in textile printing. Displaces tin oxalate; is safe to use as it will not tender the fabric.

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For textiles, fabrics and leather.

### WOOL MORDANT

Displaces both the bichromate of soda and chrome assistant in the mordanting of wool, prior to the dyeing operation. Assures fast and level dyeings, at a lower cost than the bichromate of soda and tartar, etc., process.

### CO-OPERATION

Samples, and directions gladly furnished upon request. Correspondence solicited.

# J. T. BAKER CHEMICAL COMPANY

Manufacturers of "Baker's Analyzed" C. P. Acids and Chemicals  
PHILLIPSBURG, N. J.

## PRODUCTS

"Baker's Analyzed Chemicals"

## ANALYZED REAGENTS

About ten years ago we began putting out chemical reagents with an analysis of impurities on the label. The innovation proved a decided success and chemists generally have given their stamp of approval. The idea has also been adopted by other manufacturers and "Analyzed Chemicals" are now being regularly specified. The analysis on the label has been a great help to the chemist in the use of his reagents.

## QUALITY

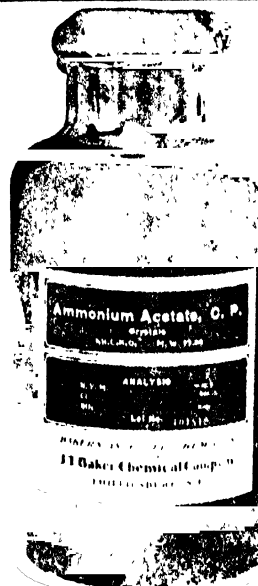
The Baker standard of quality has always signified the best that can be produced in the line of chemicals and acids for reagent use. Our guarantee of analysis means that our reputation is back of the label on the bottle and that the product is dependable. It is our constant effort to improve the quality of our products, the accuracy of their analyses, and the method of packing.

## C. P. ACIDS

Hydrochloric, Sp. Gr. 1.19  
Nitric, Sp. Gr. 1.42  
Sulfuric, Sp. Gr. 1.84  
Ammonium Hydrate, Sp. Gr. 0.90

## C. P. CHEMICALS

Acetic Anhydride, C. P.  
Acid, Arsenous, C. P.  
Acid, Carbolic, C. P.  
Acid, Chromic, C. P.  
Acid, Citric, C. P.  
Acid, Formic, C. P.  
Acid, Molybdic, C. P.  
Acid, Oxalic, C. P.  
Acid, Picric, C. P.  
Acid, Tartaric, C. P.  
Alcohol, Methyl, Absolute  
Aluminum Sulfate, C. P.  
Ammonium Acetate, C. P.  
Ammonium Carbonate, C. P.  
Ammonium Chloride, C. P.  
Ammonium Molybdate, C. P.  
Ammonium Nitrate, C. P.  
Ammonium Oxalate, C. P.  
Ammonium Persulfate, C. P.  
Ammonium Phosphate, C. P.  
Ammonium Sulfate, C. P.  
Ammonium Thiocyanate, C. P.  
Barium Chloride, C. P.  
Barium Hydrate, C. P.  
Benzene, C. P.  
Cadmium Chloride, C. P.  
Carbon Bisulfide, C. P.  
Carbon Tetrachloride, C. P.  
Chloroform, C. P.  
Copper Chloride, C. P.  
Copper Sulfate, C. P.  
Dextrose, C. P.  
Ether, C. P.  
Ether, Petroleum  
Ferric-Ammonium Sulfate, C. P.  
Ferric Sulfate, C. P.



STANDARD PACKAGE FOR "BAKER'S ANALYZED C. P. CHEMICALS"

Ferrous Sulfate, C. P.  
Lead Acetate, C. P.  
Lead Oxide, C. P.  
Lead Peroxide, C. P.  
Magnesium Chloride, C. P.  
Magnesium Sulfate, C. P.  
Mercuric Chloride, C. P.  
Potassium Bichromate, C. P.  
Potassium Bisulfate, C. P.  
Potassium Carbonate, C. P.  
Potassium Chlorate, C. P.  
Potassium Chloride, C. P.  
Potassium Cyanide, C. P.  
Potassium Ferricyanide, C. P.  
Potassium Ferrocyanide, C. P.  
Potassium Hydrate, C. P. Sticks  
Potassium Iodide, C. P.  
Potassium Permanganate, C. P.  
Potassium Sulfate, C. P.  
Sodium Acetate, C. P.  
Sodium Bicarbonate, C. P.  
Sodium Bichromate, C. P.  
Sodium Bismuthate, C. P.  
Sodium Bisulfate, C. P.  
Sodium Borate, C. P.  
Sodium Carbonate, C. P.  
Sodium Chloride, C. P.  
Sodium Hydrate, C. P.  
Sodium Nitrate, C. P.  
Sodium Nitrite, C. P.  
Sodium Peroxide, C. P.  
Sodium Phosphate, C. P.  
Sodium Sulfate, C. P.  
Sodium Thiosulfate, C. P.  
Sodium Tungstate, C. P.  
Zinc Oxide, C. P.

## CATALOG

Complete catalog and price-list sent on request.

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### CO-OPERATION

Samples, and directions gladly furnished upon request. Correspondence solicited.

## REDISTILLED AND CRUDE HYDROCARBON OILS

Product	Remarks
Shingle Stain Oil.....	Specially prepared clear tar oils with a specific gravity of approximately 1 at 15.5° C. Lumpid point not above 0° C. Free from tar acid. Shingle stain oil is particularly adapted for production of light color shingle stains and other paint specialties.
Special Heavy Oil.....	
Creosote Oil.....	A tar oil with a specific gravity of approximately 1 at 15.5° C.
Neutral Hydrocarbon Oil.....	A clear, lumpid oil, reddish-brown in color.

## PHENOLS, CRESOLS AND SPECIAL PRODUCTS

Phenol, U. S. P., Natural.....	Produced by fractional distillation and guaranteed to meet U. S. P. specification. Melting point 39°-40° C., or higher if especially desired.
Phenol, U. S. P., Synthetic.....	Produced synthetically, guaranteed not less than 96% absolute phenol.
Cresol, U. S. P.....	A mixture of isomeric cresols, free from phenol and meeting U. S. P. specification.
Refined Cresylic Acid, No. 5.....	A true cresol having a wider range of distillation than Cresol, U. S. P.
Ortho-Cresol.....	A completely separated cresol isomer, with a melting-point not less than 28° C.
Meta-Para-Cresol.....	A refined cresol mixture containing approximately 40% meta-cresol and 60% para-cresol.
Maleic Acid.....	Produced synthetically. Purity over 98%.
Fumaric Acid.....	Produced synthetically. Purity over 90%.
Malic Acid, F. P.....	Produced synthetically. High degree of purity. Suitable for use in food products.
Anthracene.....	Guaranteed to contain not less than 80% anthracene.
Carbazole.....	Guaranteed to contain not less than 80% carbazole.
Phenanthrene.....	A refined product offered in various percentages of purity depending on trade requirements.
Nitronaphthalene.....	Guaranteed melting-point 55° C.
Alpha-Naphthylamine.....	Guaranteed melting-point not less than 45° C.
Pyridine, Denaturing.....	Light straw-color, distilling approximately 50% at 140° C. and 90% at 160° C. Offered particularly for denaturing purposes.
Pyridine, Commercial.....	Very light straw-color, distilling 100% below 200° C.
"Cumar".....	A synthetic neutral resin or gum, produced from coal-tar distillates by a scientifically and closely controlled process. Graded principally by melting-point, ranging from 50° to 160° C.
Denaturing Benzols.....	Meeting U. S. Government specifications for denaturing alcohol by formulas 2A or 2B.
"Barretan" Synthetic Tanning Extracts.....	Extracts for the tanning of practically every type of leather.

## REFINED NAPHTHALENE

Naphthalene, Flake.....	All forms of refined naphthalene represent a sublimated or crystallized white product having a minimum melting-point of 79° C., with no appreciable quantities of oils, tars, or tar acids present.
Naphthalene, Small Balls.....	
Naphthalene, Large Balls.....	
Naphthalene, Crushed.....	
Naphthalene, Powdered.....	
Naphthalene, Granulated.....	
Naphthalene, Rice.....	
Naphthalene, Lump.....	
Naphthalene, One-ounce Cakes.....	
Naphthalene, Square Tablets.....	
Naphthalene, Round Tablets.....	
"Cryst Alba".....	
Naphthalene, Crude.....	
	A very highly refined, sublimated product in scales or flakes.
	A settled naphthalene containing varying quantities of tar oils. Melting-point averages approximately 70° C.

## DISINFECTANTS

"Pyxol".....	An emulsifiable disinfectant with a guaranteed carbolic coefficient of 20 as determined by the Rideal-Walker method.
"Tarola X".....	A standard cattle and sheep-dip.
Liquor Cresolis Compositus, U. S. P.....	Guaranteed to meet U. S. P. specification and Federal Regulations as a dip.
Special Cresol Compound.....	A permissible substitute for Liquor Cresolis Compositus, U. S. P.
Disinfectants, Coefficients 2 to 20 incl...	Emulsifiable coal-tar disinfectants, carbolic coefficient guaranteed as determined by the Rideal-Walker method.

# THE BARBER ASPHALT PAVING COMPANY

Producers of Native Asphalts and Asphaltic Products

LAND TITLE BUILDING, PHILADELPHIA, PA.

Cable Address  
"BASPACO", Philadelphia  
All Commercial Codes

BRANCH OFFICES  
New York, N. Y.      Chicago, Ill.      Kansas City, Mo.  
Atlanta, Ga.      Pittsburgh, Pa.      St. Louis, Mo.  
PLANTS AND LABORATORIES  
Madison, Ill.      Maurer, N. J.



## PRODUCTS

### Asphalts

Trinidad Lake

Bermudez Lake

### Gilsonite

#### "Genasco"

Asphalt Ready Roofing

Asphalt Sealbac Shingles

Asphalt Built-up Roof Materials, - Trinidad Lake

Asphalt

Asphalt Mastic, "Genasco Vulcanite" Brand

Asphalt Pipe-joint Cement

Asphalt Paints

Asphalt Putty

Asphalt Roof Paints

Asphalt Battery-sealing Compound

Mineral Rubber

Mineral Spirits

Solvents

Pharmaceutical Oil

Frothing Reagents

Flotation Oils

Soluble Oils

Paint Oils

Polishes, Furniture and Auto

Mineral Wax

Ammonium Sulfate

Motor Oils

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Manufacture of paints and varnishes, resisting the effects of water, acids, alkalis and fumes.

Production of printing inks.

Electrical insulation and manufacture of insulating compounds.

Ingredient in rubber compounding in the production of mechanical rubber goods.

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## ASPHALT MASTIC

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Acid-proof Mastic is rendering exceptional service as a lining for concrete, metal and wooden tanks. Mastic tank-linings are successfully withstanding a

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## GILSONITE

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Compounds produced by the use of considerable amounts of Gilsonite are used extensively in the electrical field, due to their rubbery character and the fact that they are non-conductors of electricity, as well as being miscible with insulating compounds. They have also an extensive use in the rubber industry and in waterproofing.

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## REDISTILLED AND CRUDE HYDROCARBON OILS

Product	Remarks
Shingle Stain Oil.....	Specially prepared clear tar oils with a specific gravity of approximately 1 at 15.5° C. Lump point not above 0° C. Free from tar acid. Shingle stain oil is particularly adapted for production of light color shingle stains and other paint specialties.
Special Heavy Oil.....	
Creosote Oil.....	A tar oil with a specific gravity of approximately 1 at 15.5° C.
Neutral Hydrocarbon Oil.....	A clear, lumpid oil, reddish-brown in color.

## PHENOLS, CRESOLS AND SPECIAL PRODUCTS

Phenol, U. S. P., Natural.....	Produced by fractional distillation and guaranteed to meet U. S. P. specification. Melting point 39°-40° C., or higher if especially desired.
Phenol, U. S. P., Synthetic.....	Produced synthetically, guaranteed not less than 96% absolute phenol.
Cresol, U. S. P.....	A mixture of isomeric cresols, free from phenol and meeting U. S. P. specification.
Refined Cresylic Acid, No. 5.....	A true cresol having a wider range of distillation than Cresol, U. S. P.
Ortho-Cresol.....	A completely separated cresol isomer, with a melting-point not less than 28° C.
Meta-Para-Cresol.....	A refined cresol mixture containing approximately 40% meta-cresol and 60% para-cresol.
Maleic Acid.....	Produced synthetically. Purity over 98%.
Fumaric Acid.....	Produced synthetically. Purity over 90%.
Malic Acid, F. P.....	Produced synthetically. High degree of purity. Suitable for use in food products.
Anthracene.....	Guaranteed to contain not less than 80% anthracene.
Carbazole.....	Guaranteed to contain not less than 80% carbazole.
Phenanthrene.....	A refined product offered in various percentages of purity depending on trade requirements.
Nitronaphthalene.....	Guaranteed melting-point 55° C.
Alpha-Naphthylamine.....	Guaranteed melting-point not less than 45° C.
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# W. J. BUSH & CO., INC.

Manufacturing Chemists

370 SEVENTH AVENUE, NEW YORK, N. Y.

(Penn Terminal Bldg.)

Cable Address  
"TANGIERINE" New York

"*Ye Oldest Essence Distillers*"

## BRANCH OFFICES

70 Kilby Street, Boston

11 W. Lake Street, Chicago

LABORATORY AND WORKS  
London, N. J.

WESTERN FACTORY  
National City, Calif.

London, England

Mitcham, England

Messina, Italy

Grasse, France

## EUROPEAN WORKS

## FOREIGN BRANCHES

Melbourne, Australia

Sydney, Australia

Moscow, Russia

Montreal, Canada

## PRODUCTS

Chemicals, Fine and Synthetic  
Essential Oils  
Essential Oils, Terpeneless  
Ethers  
Food Colors  
Fruit Flavors  
Oleoresins  
Sugar Colorings

## CHEMICALS, FINE AND SYNTHETIC

Amyl Acetate (Absolute)	Eugenol
Amyl Butyrate	Geraniol
Amyl Valerianate	Geranyl Acetate
Aniline	Heliotropine
Benzaldehyde, U. S. P.	Isoeugenol (Rectified)
Benzyl Acetate	Linalyl Acetate
Benzyl Benzoate	Methyl Anthranilate
Citral	Nerolin
Coumarin	Phenylethyl Alcohol
Eucalyptol	Thymol
	Vanillin

## ESSENTIAL OILS

Almond, Bitter, U. S. P.	Lemongrass
Almond, Bitter (Free from Prussic Acid)	Mace
Cardamom	Mustard
Cassia, Redistilled	Neroli
Cinnamon (Ceylon)	Nutmeg
Clove	Orange (California)
Coriander	Orris
Eucalyptus	Patchouli
Fennel	Peppermint
Geranium (African)	Rose
Ginger	Sandalwood
Lavender	Vetiver
Lemon (Pressed from ripe fruit in Southern California)	Wintergreen (Gaultheria)

## ESSENTIAL OILS, TERPENELESS

Anise	Limes
Caraway	Orange
Lemon	

## ETHERS

Acetic	Pelargonic
Butyric	Rum
Cenanthic	Valerianic

## FOOD COLORS "HYGIENO"

"Hygieno" colors are of purely natural origin, and comply with the pure food laws of all states. They are not coal-tar colors. We supply "Hygieno" colors in all the necessary tints in both paste and liquid form, packed in 1 lb. and 5 lb. bottles and 125 lb. kits.

Blacks	Pinks
Blues	Reds
Browns	Violets
Greens	Yellows

## CERTIFIED FOOD COLORS

These Colors are made from the dyes permitted by the U. S. Department of Agriculture, and are certified in accordance with the regulations of the Department.

Blue	Pinks
Brown	Reds
Greens	Violet
Lilac	Yellows
Orange	Yolk of Egg Shade

## FRUIT FLAVORS

We produce both natural and artificial fruit flavors of all kinds for confectioners, soft drink manufacturers and bottlers.

## OLEORESINS

Capsicum	Orris
Cloves	Sandalwood
Ginger	Vanilla

## SUGAR COLORINGS (Caramels)

Unequaled for strength and brilliancy. Will not deposit. In two grades. Two Stars and Three Stars. For all purposes. Unaffected by fruit acids.

## OIL OF APRICOT KERNELS

This oil is pressed at our California plant from Apricot Kernels exclusively.

It is a pure, wholesome, nutritious food product of delicate flavor, serving as a perfect substitute for olive oil, cotton-seed oil, and the like, for all food purposes.

Industrially Oil of Apricot Kernels serves admirably for the production of textile soaps, textile lubricants, softeners, etc.

Packed in 50 lb. boxed tins and 400 lb. drums.

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Importers and Exporters

5 Cliff Street

Cable Address "CAMPBELL", New York

NEW YORK, N. Y.

WAREHOUSE New Brunswick, N. J.

## PRODUCTS

Chemicals for the Manufacture of Matches, Fire-works and Railway Signals, and for other Industries.

## BENZIDINE

Base Dry  
Sulphate Paste

## FORMALDEHYDE

## FUCHSINE

## GLUE

## GUMS

Arabic  
Damar  
Tragacanth

## OXALIC ACID

## PHOSPHORUS

Amorphous (Red)  
Sesquisulphide  
Yellow

## POTASSIUM SALTS

Bichromate  
Chlorate  
Hydroxide (Caustic Potash)  
Perchlorate

## SAL AMMONIAC

## SODA ASH

## SODIUM SALTS

Bichromate  
Chlorate  
Ferrocyanide (Yellow Prussiate)  
Hydroxide (Caustic Soda)  
Nitrite

## STRONTIUM NITRATE

## ZINC OXIDE

## SERVICE

We handle many of the chemicals required in special industries and can supply products to meet particular specifications, and guarantee all products to be of standard grade.

## STOCKS

At our New Brunswick warehouse we maintain stocks of chemicals for the match and other industries, from which prompt shipments can always be made.

## QUOTATIONS

Quotations and other information regarding our products gladly furnished at all times

## EXPORT

Special attention given to foreign orders and inquiries.

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"Genasco" Naphthas and Solvents merit the particular attention of chemical manufacturers of all kinds, paint and varnish producers, and others having use for solvents of low, intermediate and high boiling-points. "Genasco" Solvents are uniform in composition and boiling-point.

## SERVICE

We have a completely equipped and up-to-date laboratory for research and testing purposes, and a staff of chemists which gladly will advise industrial plants and others concerning the use of any of our products. We will gladly answer all inquiries regarding the possibility of using Asphalts or Asphaltic products to advantage.

# CELLULOSE PRODUCTS CORPORATION

78-80 Paris Street  
NEWARK, N. J.

Cable Address  
"CELLULOSE," Newark

## PRODUCTS

**Nitrocellulose Materials**  
**Soluble Washed Films**  
**Film Perforations**  
**Scrap Celluloid**  
**Raw Films**

## NITROCELLULOSE MATERIALS

We are producers of reclaimed nitrocellulose material of various kinds and colors for all purposes, and shall be glad to co-operate with users of these materials to produce the exact grade required for their particular product.

## SOLUBLE WASHED FILMS

Standard cinematograph film in scrap form is thoroughly and completely degelatinized and desilvered. All traces of alkali, silver, silver salts and gelatin are removed, as well as all silver spots. This scrap is perfectly transparent, and water-white in color. It is guaranteed to be absolutely free from cellulose acetates or other constituents which might exert a harmful influence in the production of plastics, solutions, etc. It is in all respects and for all purposes the equal and complete equivalent of new gun-cotton, with the advantage of being very much cheaper in price.

This material is completely soluble, without residue in acetone, amyl acetate, ethyl acetate or in denatured alcohol (U. S. Internal Revenue Dept. Regulations. Specially denatured alcohol formulas Nos. 1, 2, 2a, 2b, 5, 10, 11, 19), also in a number of newer chlorinated solvents.

When dissolved in the proper solvent, this material is eminently suited for the production of finishes and lacquers for patent and artificial leather; dope finishes for split, automobile and upholstery leathers; waterproofing textile fabrics of various kinds; "dopes" for airplane wings; varnishes, lacquers, coatings, and the like, for automobiles, carriages, electric insulation, food containers, metal, picture frames, railroad cars, signs; special lacquers for chemical and physical instruments such as analytical balances, microscopes, telescopes, etc.; floor, transparent, waterproof, weatherproof, and wood varnishes; cements and adhesives for leather belting, leather to metal, etc.; paint removers.

When dissolved in our special solvent, our reclaimed films can be made into sheets of any size, which are perfectly transparent, and can be utilized for the manufacture of eyepieces for goggles, gas-masks, etc., and water- and weatherproof windows for tents, automobile tops, ready-made houses, huts, airplanes, and the like.

## FILM PERFORATIONS

These small oval pieces, about 2 mm. wide and 4 mm. long, are of a superior quality. They are of the

same general composition as raw film, except that they have never been through the developing and fixing solutions.

The perforations are treated by our scientific and complete process of degelatinization and desilverization and are thoroughly clean and dry.

These small particles of film material possess all the advantages of our soluble washed film scrap, and are used in the same manner and for the same purposes. In addition they are more easily handled, go into solution more readily, and are ideal for the preparation of solutions, as the exact weight or volume required can be measured out by means of a scoop.

## SCRAP CELLULOID

We only handle camphor celluloid, never that produced by means of camphor substitutes, hence it is never necessary to add gum or synthetic camphor when working up our celluloid scrap.

The scrap is clean, free from foreign matter, and can be furnished in the following colors: Transparent, Shell, White, Ivory, Black, and Mixed. We also furnish this material in the form of shavings and lathe turnings, but only white or shell.

This material is soluble in acetone, amyl acetate, denatured alcohol (Formulas Nos. 2, 2a, 2b), and other solvents.

This scrap can be soaked down in a cheap solvent, such as acetone, until it becomes plastic, and then formed into rods, tubes, etc.

It is used for the preparation of various lacquers, varnishes, waterproofing compounds, and the like; also as a constituent of paint removers.

We are prepared to furnish celluloid solutions of any color for use in spraying or dipping handles of all kinds, cabinets, seats, and the like.

We have so enlarged our facilities that we are in a position to do this spraying or dipping for those who desire it, promptly and efficiently.

## RAW OR SCRAP FILMS

This product, which is mutilated or otherwise unfit for show purposes, is offered for sale in the condition as received from direct sources, such as moving-picture studios, laboratories, and producers. It has not been treated by us in any way.

Being soluble in the usual solvents, it can be manufactured into varnishes, lacquers, etc.

## SHIPPING CONTAINERS

The various nitrocellulose materials are packed and shipped in strong wooden boxes (50, 100 and 200 lb.).

## SERVICES

Full details for utilizing our products, and working formulas will be gladly furnished to those interested. Send us your inquiries. They will have careful attention. Our experts are at your disposal for advice, and to help you solve your problems and difficulties.

# THE BARBER ASPHALT PAVING COMPANY

Producers of Native Asphalts and Asphaltic Products

LAND TITLE BUILDING, PHILADELPHIA, PA.

Cable Address  
"BASPACO", Philadelphia  
All Commercial Codes

BRANCH OFFICES  
New York, N. Y.      Chicago, Ill.      Kansas City, Mo.  
Atlanta, Ga.      Pittsburgh, Pa.      St. Louis, Mo.  
PLANTS AND LABORATORIES  
Madison, Ill.      Maurer, N. J.



## PRODUCTS

### Asphalts

Trinidad Lake

Bermudez Lake

### Gilsonite

#### "Genasco"

Asphalt Ready Roofing

Asphalt Sealbac Shingles

Asphalt Built-up Roof Materials, - Trinidad Lake Asphalt

Asphalt Mastic, "Genasco Vulcanite" Brand

Asphalt Pipe-joint Cement

Asphalt Paints

Asphalt Putty

Asphalt Roof Paints

Asphalt Battery-sealing Compound

Mineral Rubber

Mineral Spirits

Solvents

Pharmaceutical Oil

Frothing Reagents

Flotation Oils

Soluble Oils

Paint Oils

Polishes, Furniture and Auto

Mineral Wax

Ammonium Sulfate

Motor Oils

## ASPHALTS

The Native Asphalts (Trinidad Lake and Bermudez Lake) possess a number of inherent properties not available in artificial substitutes, the pitches or synthetic compounds.

Native asphalts are being used with constant success for the following purposes

Construction of acid and alkali-proof floors.

Manufacture of paints and varnishes, resisting the effects of water, acids, alkalis and fumes.

Production of printing inks.

Electrical insulation and manufacture of insulating compounds.

Ingredient in rubber compounding in the production of mechanical rubber goods.

The technical use of Asphalts is increasing each year and new industries constantly are finding in asphaltic products a solution to many of their problems.

## ASPHALT MASTIC

"Genasco Vulcanite" Mastic is unequalled as a flooring material where resilient, monolithic, waterproof, dustless, sanitary and lasting surface is required.

It is the ideal flooring for laboratories, chemical plants and other places where acid resistance is essential. "Genasco Vulcanite" Mastic floors render the maximum service in factories of all kinds, bakeries, hotels, and similar places.

Acid-proof Mastic is rendering exceptional service as a lining for concrete, metal and wooden tanks. Mastic tank-linings are successfully withstanding a

36% sulfuric acid with 2% nitric acid at 125° F.

Where it is absolutely essential that all water and moisture be excluded from floors and walls, as in silk and other mills, mastic fills the need. It also serves as a lining for pipes carrying chemicals in many plants.

Mastic is finding very extensive use as a complete waterproofing system, for the protection of metal, concrete, brick and masonry construction.

## GILSONITE

Gilsonite, the purest natural bitumen, is a hard, lustrous, black, brittle substance. It is plastic when warmed, and fuses at low heat. Gilsonite is completely soluble in all proportions in carbon bisulfide, benzol, chloroform and turpentine.

Gilsonite is an invaluable ingredient in hard-drying black paints, baking japans, varnishes, etc., due to its inherent natural components.

Compounds produced by the use of considerable amounts of Gilsonite are used extensively in the electrical field, due to their rubbery character and the fact that they are non-conductors of electricity, as well as being miscible with insulating compounds. They have also an extensive use in the rubber industry and in waterproofing.

## "GENASCO" ACID-PROOF PAINT

"Genasco" Acid-Proof Paint meets the need for a paint that will protect against dilute acids and acid fumes.

It gives excellent service in resisting corrosive gases, dilute acids and alkalis. Manufacturers of sulfuric and nitric acids will find it invaluable. It is also used in painting battery boxes and the interior of refrigerating plants exposed to brine, or ammonia fumes.

Our asphalt paints are manufactured under strict laboratory control, following formulas prepared for providing service under just the conditions for which we recommend them.

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# CHIPMAN CHEMICAL ENGINEERING COMPANY, INC.

Manufacturers of Arsenicals—Producers of White Arsenic

Cable Address  
"DEOXADIZER", New York  
Code "A B C", Fifth Ed

BRANCH OFFICE  
525 Market Street  
San Francisco, Calif

95-97 Liberty St.

NEW YORK, N. Y.

ATLAS ARSENIC MINE  
Floyd County, Va.

FACTORIES  
Bound Brook, N. J.  
Portland, Ore.  
Houston, Tex.

## PRODUCTS

White Arsenic

Arsenicals

Insecticides

Disinfectants

"Ruskillia"—Structural Steel Paint

Chipman—Skin and Hide Preservative

Atlas—Wood Preservative

Chipman Disinfectant

Chipman Sheep Dipping Powder

## ATLAS CATTLE DIP IMPROVED

A concentrated arsenical preparation approved by the United States Department of Agriculture for official dipping of cattle for tick eradication

## ATLAS 50% CRESOL COMPOUND

A highly efficient disinfectant and antiseptic giving a clear solution in water. Approved by the United States Department of Agriculture for official disinfection of stock cars, etc.

## "ATLASOL" DISINFECTANT

A coal tar product, giving a clean milkwhite permanent emulsion with water. Coefficient 3 when tested by the Hygienic Laboratory method

## ATLAS "A" WEED KILLER

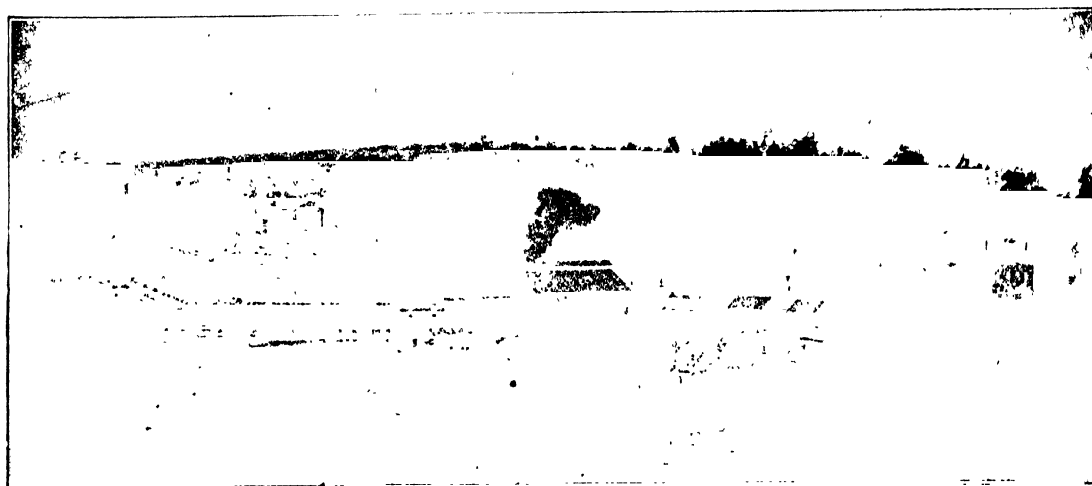
The most effective and widely used Weed Killer on the market. It eradicates obnoxious weed growth on roads, driveways, tennis courts, etc. Largely used by railroads for destroying vegetation on the right of way

## SODIUM ARSENITE SOLUTIONS

Concentrated solutions of sodium acid arsenite, primary and secondary sodium arsenite

## ATLAS BOILER COMPOUND

Highly concentrated liquid preparation for softening boiler waters without preliminary treatment. Prevents corrosion due to oxidation. Removes encrusted solids



ATLAS ARSENIC MINE AND REFINERY, FLOYD COUNTY, VA.

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# COMMERCIAL SOLVENTS CORPORATION

GENERAL OFFICES AND PLANT

Cable Address  
'COMSOLVENT', New York

TERRE HAUTE, INDIANA

EASTERN SALES AND EXPORT  
17 East 12d Street New York, N. Y.

## PRODUCTS

Acetone, U.S.P.  
Butanol (Butyl Alcohol)  
Ethyl Alcohol, Denatured

## PLANT

Our plant, located in Terre Haute, Ind., was owned and operated during the late war by the United States and British Governments for the special purpose of manufacturing acetone from corn (maize).

## PROCESS

We own exclusive rights to operate the Weizmann process (patented in the U. S.) for the bacterial fermentation of corn or other cereal grains. All raw materials are thoroughly sterilized before use, insuring exceptionally pure products and the absolute absence of impurities usually found in these and similar products manufactured by other processes.

## ACETONE (Dimethylketone) $\text{CH}_3\text{CO.CH}_3$

The Acetone produced by us is U. S. P., and surpasses the stringent specifications of the United States and British War Departments. It is free from poisonous and other impurities found in Acetone made from wood distillation products.

### Specifications

Specific Gravity: Less than 0.80 (15°C)  
Boiling-point: 56.5°C. (90 to 95% distilling below 58%).  
Color: Water-white.  
Acidity: None.  
Alkalinity: None.  
Water: None.

### Uses

General solvent (varnishes, lacquers, acetylene gas, etc.).  
Special solvent in the manufacture of cordite, smokeless powder, celluloid, plastics, etc.  
Manufacture of chloroform.  
Manufacture of Diacetone Alcohol.  
For Denaturing Alcohol.  
Organic synthesis.

### Shipping Containers

Iron drums (55,110 gallons).  
Tank-cars (8,000 gallons).

## BUTANOL (Butyl Alcohol) $\text{CH}_3(\text{CH}_2)_2\text{CH}_2\text{OH}$

The Commercial Solvents Corporation is the largest manufacturer of Butanol (Butyl Alcohol) in America. Our product is strictly anhydrous, water-white in color, free from acids and aldehydes, and neutral in reaction.

Butanol has successfully replaced Fusel Oil in general use as a solvent.

### Specifications

Specific Gravity: 0.810 to 0.815 (20°C, 20°C).  
Boiling-point: 114° to 117°C. (90% distilling between these temperatures).  
Color: Water-white.  
Aldehydes: None.  
Water: None.  
Acetic Acid: None.  
Butyric Acid: None.  
Lactic Acid: None.

### Uses

Special solvent and vehicle in the pyroxylin industries (celluloid, photographic film, etc.).  
General solvent (japans, lacquers, coatings, dopes, etc.).  
Manufacture of Butyl Acetate, Butyl Aldehyde, Butyl Salicylate, Butylene Gas, Butyric Acid, Butyric Ether, Ethyl Butyrate, etc.  
Production of color bases, synthetic rubber.  
Vehicle for bronze powders.  
Constituent of paint and varnish removers, imitation leather coatings and patent leather "dopes."  
General organic synthesis.  
Preparation of liniments, drug and pharmaceutical preparations, fruit essences.  
Production of methylethyl ketone.  
Solvent for gums, resins, shellac, soaps, essential oils, vegetable oils, waxes, pigments, drugs, chemicals, etc.

### Shipping Containers

Tin cans (1, 5, 10 gallons).  
Iron drums (55,110 gallons).  
Tank-cars (8,000 gallons).

## ETHYL ALCOHOL (188 and 190 proof).

Denatured in accordance with all formulas.

### Shipping Containers

Iron drums (55,110 gallons).  
Tank-cars (8,000 gallons).

## SERVICES

The Chemical Staff of the Commercial Solvents Corporation will, at all times, be pleased to cooperate with manufacturers in solving their solvent problems. We maintain, at our plant, well equipped Research Laboratories, the services and facilities of which are for the assistance of our customers.

# COMMONWEALTH CHEMICAL CORPORATION

Cable Address  
COMMONCHEMCO New York  
Codes  
A B C 5th Edition  
Western Union

MAIN OFFICE  
15 Park Row  
NEW YORK, N. Y.

WESTERN SALES OFFICE  
608 South Dearborn Street  
CHICAGO, ILL.

## COMMONWEALTH CHEMICAL CORPORATION OF CANADA, LIMITED

WALKERVILLE, ONTARIO, CANADA

### PRODUCTS

**Benzaldehyde**  
**Benzoic Acid**  
**Benzyl Acetate**  
**Cinnamic Acid**  
**Coumarin**  
**Ethyl Benzoate**  
**Lithium Benzoate**  
**Methyl Benzoate**  
**Sodium Benzoate**

#### BENZALDEHYDE, Technical

97-98% aldehyde content.  
Used by manufacturers of dyestuffs, photographic  
and pharmaceutical chemicals  
Containers:  
Returnable steel drums, approximately 500 and  
1000 lb. net.  
Returnable carboys of 100 lb. net.

#### BENZALDEHYDE, U. S. P.

98-99% aldehyde content.  
Water-white.  
Boiling-point 177°-179° C.  
Free from organic chlorides (Lunge's method).  
Containers:  
Tin cans of 5 and 25 lb. net.  
Returnable carboys of 100 lb. net  
Returnable block-tin-lined drums, 500 and 1000  
lb. net.

#### BENZOIC ACID, U. S. P., Sublimed

Large, pure white, lustrous flakes.  
Melting-point 121° C.  
Free from foreign odor.  
Meets requirements of United States, British and  
Japanese Pharmacopeias, and French Codex.  
Containers:  
Kegs of 50 and 100 lb. net.  
Tin cans of 1, 2, 5, 10 and 25 lb. net.

#### BENZYL ACETATE, C. P.

97-98% ester content.  
Boiling-point 216° C.  
Water-white.  
For perfumers and toilet-soap-makers.  
Containers:  
Tin cans of 5 and 25 lb. net.  
Returnable block-tin-lined drums, 500 and 1000  
lb. net.

#### CINNAMIC ACID, Synthetic, C. P.

Melting-point 130° C.  
Odorless crystals.  
Containers:  
Kegs of 50 and 100 lb. net.  
Tin cans of 1, 2, 5, 10 and 25 lb. net.

#### COUMARIN, C. P.

White, shiny crystals.  
Melting-point 67° C. Boiling-point 291° C.  
Containers:  
Tin cans of 1, 5, 10 and 25 lb. net.

#### ETHYL BENZOATE (Benzoic Ether)

96-97% ester content.  
Water-white.  
Boiling-point 212° C.  
Containers:  
Tin cans of 5 and 25 lb. net.  
Returnable block-tin-lined drums, 500 and 1000  
lb. net.

#### LITHIUM BENZOATE, U. S. P., 8th Revision

White, odorless and tasteless powder.  
Makes a clear, colorless solution.  
Answers purity tests of French Codex, but con-  
tains no water of crystallization.  
Containers:  
Kegs of 50 and 100 lb. net.  
Tin cans of 1, 2, 5, 10 and 25 lb. net.

#### METHYL BENZOATE (Oil of Niobe)

96-97% ester content.  
Water-white.  
Boiling-point 199° C.  
Containers:  
Tin cans of 5 and 25 lb. net.  
Returnable block-tin-lined drums, 500 and 1000  
lb. net.

#### SODIUM BENZOATE, U. S. P., 8th and 9th Re- visions

White, amorphous powder.  
Readily soluble.  
Odorless, tasteless.  
Makes a clear, colorless solution.  
Meets requirements of British and Japanese Phar-  
macopeias. Answers purity tests of French  
Codex, but contains no water of crystallization.  
Containers:  
Kegs of 50 and 100 lb. net.  
Tin cans of 1, 2, 5, 10 and 25 lb. net.

TELEPHONE: 5445 Worth

ESTABLISHED 1857  
INCORPORATED 1907Cable Address, COXTON, New York  
(A, B, C Code, 4th and 5th Ed.)  
Western Union

# CHAS. COOPER & CO.

## Manufacturing Chemists and Importers

194 Worth Street, NEW YORK. N. Y.  
Near Chatham Square

**PRODUCTS****Specialties for the Wholesale Drug Trade**

Acid, Boric  
Acids, Muriatic, Nitric and Sulphuric, C. P.  
Alum, Powdered  
Ammonia, U. S. P.  
Bicarbonate Sodium  
Castor Oil, U. S. P.  
Cathartic Salt  
Collodion, U. S. P.  
Collodion, Flexible  
Epsom Salt  
Ether, Sulphuric, U. S. P.  
Silver Nitrate, etc.

**Specialties for the Paint and Varnish Trade**

Acids, Muriatic, Nitric and Sulphuric  
Ammonia, Technical  
Alcohol, Denatured  
Black Oxide of Manganese  
Bronzing Liquid  
Chromium Oxide  
Collodions  
Ketone Solvent  
Lead Acetate  
Manganese Borate, etc.

**Specialties for the Photo-engraving Trade**

Acids, Muriatic and Nitric  
Alcohol, Denatured  
Ammonium, Iodide  
Benzol  
Cadmium, Iodide  
Collodion Base  
Collodion, Stripping  
Cotton, Absorbent  
Cotton, Negative  
Cotton, Soluble  
Ether, Sulphuric, U. S. P.  
Potassium, Bromide  
Potassium, Iodide  
Sodium Cyanide  
Sodium Monosulphide, etc.

**Specialties for the Rubber Trade**

Antimony, Crimson  
Antimony Golden, Sulphurated  
Barium Sulphate  
Benzol  
Carbon Bisulphide  
Carbon Tetrachloride  
Caustic Soda  
Chromium Oxide, Green  
Flour Sulphur  
Iron Oxide, Red  
Neutral Salts for Rubber Reclamation  
Zinc Oxide, etc.

**Specialties for the Plating Trade**

Acids, Muriatic, Nitric and Sulphuric  
Ammonia  
Arsenic  
Acid, Boric  
Copper Carbonate  
Copper Sulphate  
Nickel and Ammonium Sulphate  
Nickel Sulphate, Pure  
Silver Nitrate  
Sodium Cyanide  
Zinc Carbonate  
Zinc Sulphate, etc.

**Specialties for the Photographic Trade**

Acid, Acetic  
Acid, Pyrogallie  
Alum, Powdered  
Chrome, Alum  
Collodion, Photo  
Cooptol  
Cotton, Absorbent  
Gold Chloride  
Hydroquinone  
Mercuric Chloride  
Potassium Ferricyanide  
Silver Nitrate  
Sodium Carbonate  
Sodium Thiosulphate (Hypo)  
Sodium Sulphite, etc.



WORKS AT NEWARK, N. J.

**QUALITY AND PRICES**

The chemicals we offer are second to none; and prices are named according to the quantity. We would appreciate an opportunity to figure on your requirements.

Monthly price list issued.

# RALPH L. CROSTHWAITE COMPANY

MANUFACTURERS' EXCLUSIVE AGENTS

Manufacturers, Importers and Exporters

BRANCH OFFICE  
1627 Marquette Bldg  
Chicago, Ill.

FACTORY  
Brooklyn, N. Y.

Chemicals, Dyestuffs and Minerals  
Rare and Unusual Ores  
15 PARK ROW, NEW YORK, N. Y.

Cable Address  
"ARELCROSCO," New York  
CODES  
Western Union, 5 letter  
A B C, Fifth Edition  
Bentleys

## PRODUCTS

Acids  
Chemicals  
Drums  
Dyestuffs  
Fluorspar  
Intermediates  
Oils  
Ores  
Paint Pigments  
Potassium Salts  
Sodium Salts

## ACIDS

Benzoic  
Boric  
Citric  
Formic  
Molybdic  
Oxalic  
Tartaric

## CHEMICALS

Alcohol; for Industrial purposes and Export  
Alcohol, Denatured, Completely, and Special Formulas  
Aluminum Sulfate  
Ammonium Sulfate  
Borax  
Chalk, Precipitated, Light  
Chrome Alum, Ground, and Lump  
Copper Oxide, Black  
Copper Suboxide, Red  
Cream of Tartar  
Formaldehyde  
Potash Alum, Ground, and Lump  
Salicylates

## DYESTUFFS

Brilliant Green  
Malachite Green, Large Crystals, and Crystalline  
Methyl Violet  
Methylene Blue  
Wool Green "S"

## FLUORSPAR

Washed Gravel  
80 to 85%  
Ground, 90%  
Ground for acid purposes, 99% plus  
We have our own Fluorspar properties in Colorado

## INTERMEDIATES

Aniline Oil  
Aniline Salt

Beta-Naphthol  
Diethylaniline  
Dimethylaniline  
Para-Nitraniline

## OILS

Castor  
Coconut  
Olive  
Olive Foots

## ORES

Molybdenum  
Tungsten  
Vanadium

Our mining properties are located in Colorado and New Mexico, and we specialize in the above alloy ores.

## PAINT PIGMENTS

Barytes  
Carbon Black  
Domestic Ocher  
French Ocher  
Red Oxide  
Whiting

## POTASSIUM SALTS

Caustic Potash  
Bichromate  
Bitartrate  
Chlorate  
Chloride  
Cyanide  
Nitrate  
Oxalate  
Permanganate  
Prussiates

## SODIUM SALTS

Benzoate  
Borate  
Chlorate  
Cyanide  
Nitrate  
Nitrite  
Oxalate

## DRUMS

We carry a large stock of second-hand drums at all times at our yard in Newark, N. J., and always have stock rolling in all parts of the country.

We also supply new drums for export trade.

Being specialists in second-hand drums for the chemical industries, we are in a position to fill promptly all orders for the standard sizes.

# THE DAVISON CHEMICAL COMPANY

Cable Address  
"DAVISON," Baltimore

Established 1832  
GARRETT BUILDING, BALTIMORE, MD.  
NEW YORK OFFICE 120 Broadway

WORKS  
Curtis Bay, Md

## PRODUCTS

Sulfuric Acid  
Acid Phosphate  
Concentrated Acid Phosphate (Double Superphosphate)

Magnesium Fluosilicate  
Niter Cake  
Sintered Pyrites Cinder

## SULFURIC ACID

Our Sulfuric acid is exceptionally low in lead, iron and arsenic. We regularly produce and have ready for shipment:

Chamber Acid,	50° Bé
Tower or Concentrated Acid,	60° Bé
Concentrated Acid,	66° Bé

We are in a position to meet any and all specifications required. We invite inquiries from all who require sulfuric acid in bulk shipments.

Shipping containers: Iron drums (725 lb.), tank cars (100,000 lb.); tank barges (up to 800 tons).

Davison Sulfuric Acid is used with constant success in petroleum refining; production of mixed acid for nitration; pickling iron and steel; in the textile, tanning, paper, rubber, and metallurgical industries; sulfonation of benzol; dyestuff manufacture; production of other acids; manufacture of sulfates, alums and various inorganic preparations; refining of coal-tar distillates, etc.

## ACID PHOSPHATE

Davison Acid Phosphate is produced in the usual Davison standard of quality and is used mainly for fertilizing purposes, either directly or for the production of mixed fertilizers.

The excellent rail and water loading facilities of The Davison Chemical Company permit them to make shipment, either in bulk or bags, in lots ranging from single carloads to cargoes for the largest freight steamers.

Special steamer-loading equipment, with a capacity of 2000 tons per day, has been installed to take care of export business.

## CONCENTRATED ACID PHOSPHATE (Double Superphosphate)

Davison Concentrated Acid Phosphate is a mono-basic Calcium Phosphate, combined with free Phosphoric Acid according to the total percentage of Phosphoric Acid required.

It is a concentrated source of phosphoric acid for plant food and mixed fertilizer manufacture. Its high strength makes it economical for shipment over long distances.

## MAGNESIUM FLUOSILICATE (Magnesium Silicofluoride)

Davison Magnesium Fluosilicate ( $MgSiF_6$ ) is of value to all branches of the ceramic industry, as well as for the production of concrete hardeners.

## NITER CAKE

This commercial grade of Sodium Bisulfate is finding extensive use as a substitute for sulfuric acid in textile dyeing, iron and steel pickling, etc.

## SINTERED PYRITES CINDER

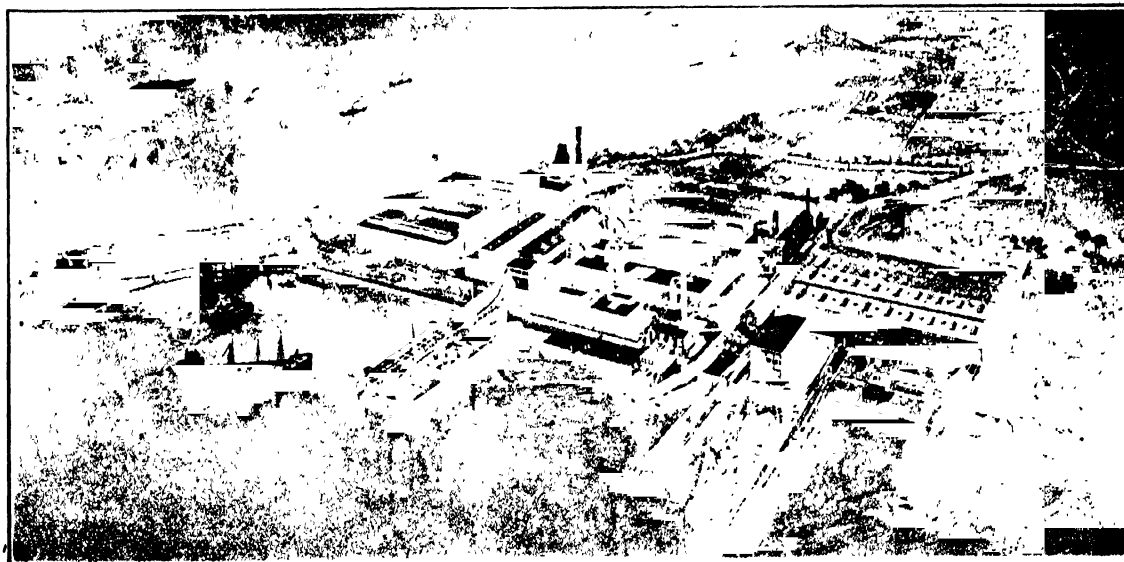
Davison Sinter finds extensive use as a source of iron. It is low in sulfur and copper; and owing to its dense yet porous structure it forms an excellent material to mix with the usual ore burden of blast furnaces.

## INQUIRIES

All inquiries should be addressed to 1100 Garrett Building, Baltimore, Md.

## PLANT

The Davison Chemical Company has the largest and most modern sulfuric acid plant and acid phosphate plant in the world. The acid plant capacity is 350,000 tons 50° Bé. per year; while the acid phosphate plant has a capacity in excess of 400,000 tons 16% basis per year.



BIRD'S-EYE VIEW OF WORKS, CURTIS BAY, MD.



# THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN

90 West Street, New York, N. Y.

Cable Address  
"DOWCHEMCO," Midland

## PRODUCTS

Acetylsalicylic Acid, NNR	Hexachloroethane
Acetic Anhydride	Hydrobromic Acid, U. S. P. or Commercial
Acetylene Tetrabromide	Indigo, Synthetic, Powder or Paste
Antimony Tribromide	Lead Arsenate, Powder or Paste
Barium Bromate	Lime Sulphur, Powder or Solution
Barium Bromide	Lithium Bromide, U. S. P.
Bromine, Purified or Commercial	Magnesium Chloride, Fused or Flake
Bromoform, U. S. P.	Magnesium Metal
Cadmium Bromate	Magnesium Sulphate, (Epsom Salt), U. S. P. or Technical
Cadmium Bromide	Methyl Salicylate, U. S. P.
Calcium Arsenate	Midland Blue R, Powder or Paste
Calcium Bromide, U. S. P.	Midland Vat Blue 5B, 50% Paste
Calcium Chloride, 73-75% Flake	Midland Cadet Blue, 50% Paste
Calcium Chloride, 73-75% Solid	Mining Salts (Bromine Salts)
Camphor Monobromated, U. S. P.	Monobromobenzol
Carbon Bisulphide	Monochloroacetic Acid
Carbon Tetrachloride	Para-dibromobenzene
Caustic Soda, 76% Flake	Pentachloroethane
Caustic Soda, 76% Solid	Phenyl Acetate
Chloroform, U. S. P.	Phenylethyl Alcohol
Chloroform, Commercial	Phenyl Salicylate, U. S. P.
Chloroethylacetate	Potassium Bromate
Chlorohydrin	Salicylic Acid, U. S. P.
Dichloromethane	Sodium Salicylate, U. S. P.
Ethyl Bromide	Strontium Salicylate, U. S. P.
Ethyl Monochloroacetate	Sulphur Chloride, Red
Ethylene Bromide	Sulphur Chloride, Yellow
Ethylene Chlorohydrin	Tetrachloroethylene
Ferrous Bromide	Tribromophenol
Ferric Chloride Crystals, U. S. P. or Commercial	Trichloroethane
Ferric Chloride Solution, U. S. P. or Neutral	Trichloroethylene
Ferrous Chloride, Crystals	



MIDLAND, MICHIGAN, PLANT OF THE DOW CHEMICAL COMPANY

# B. F. DRAKENFELD & CO., INC.

Established 1869

50 MURRAY ST., NEW YORK, N. Y.

 Cable Address  
 "DRAKENFELD"  
 New York

## BRANCHES

Chicago, Ill.

East Liverpool, O.

Washington, Pa.

Wheeling, W. Va.

## PRODUCTS

**Manufacturers and Importers of Industrial Chemicals, Metallic Oxides and Vitrifiable Colors for glass-makers, potters and enamelers.**

Alumina Oxide Hydrate

Aluminum Paints

Antimony Oxide

Arsenic

Bone Ash

Boracic Acids

Borax

Bronze Powders

Bronzing Liquid

Cadmium Metal

Cadmium Sulphides

Chrome Oxides

Clay, Ball and China

Cobalt Acetate

Cobalt Carbonate

Cobalt Chloride

Cobalt Hydrate

Cobalt Linoleate

Cobalt Metal

Cobalt Nitrate

Cobalt Oxides

Cobalt Sulphate

Colors, Cement

Colors, China

Colors, Enamel

Colors, Glass

Copper Oxides

Copper Sulphate

Feldspar

Flint

Fluorspar

Glass Decolorizers

Gold Paints

Iron Chromate

Iron Oxides

Kryolith

Lepidolite

Manganese Oxides

Metal Leaf

Nickel Anodes

Nickel Carbonate

Nickel Metal

Nickel Nitrate

Nickel Oxides

Nickel Sulphate

Nickel Ammonium Sulphate

Paris White, Chffstone

Powder Blue

Putty Powder

Rutile

Selenium

Selenium Oxychloride

Sodium Selenite

Tin Oxide

Titanium Oxide

Uranium Oxide

Whiting

Zinc Oxides

# E. I. DU PONT DE NEMOURS & CO., INC.

Dyestuffs and Dyestuff Intermediates  
Acids, Heavy Chemicals and Chemical Products



WILMINGTON, DELAWARE



## PRODUCTS

Dyestuffs	
Dyestuff Intermediates	Pages 1116-7
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Pharmaceuticals	Page 1118
Chemical Products	Page 1118

## DYESTUFFS SALES DIVISION

Wilmington, Del.

## DYESTUFF INTERMEDIATES

For Making Synthetic Dyestuffs, Accelerating the Vulcanization of Rubber and for the Flotation of Copper, Zinc, Lead and Silver Ores.

Years of intensive chemical research, together with the unrivaled resources which enable us to command the finest available raw materials, manufacturing facilities and technical skill, have made it possible to produce an unusually complete variety of dyestuff intermediates that are uniform in quality of the highest standard.

The following specifications for a few of these products selected at random are typical of the rigid requirements that all our goods are obliged to meet before being offered for sale. Despite the fact that these materials now approximate or exceed the ideal commercial purity, as based upon prevailing standards, we have by no means stopped progress toward the achievement of still higher grade chemicals.

For those desiring additional facts, we have published a booklet entitled, "Dyestuff Intermediates," which describes the properties and uses of nearly forty compounds of this type. Information of the same nature can be promptly supplied regarding any substances of recent development, such as anthranilic acid, anthraquinone, ortho-nitroanisole, ortho-aminidine, phthalic anhydride and mixed-xyldines.

### Alpha-Naphthylamine $C_{10}H_7NH_2$

**Properties**—A light pink, crystalline solid having a slightly offensive odor. Its purity approximates 98 to 99%, while the freezing-point ranges from 45° to 45.5°C or higher. The product contains no iron, not more than a trace of moisture, less than 2% of beta-naphthylamine, is completely soluble in dilute hydrochloric acid and produces a clear diazo solution.

**Uses**—Du Pont alpha-naphthylamine is highly satisfactory for the manufacture of all dyestuff intermediates and colors, as well as for use by the textile industry in developing dyes on the fibers of cloths. We can supply either the refined or crude grades when required for the flotation of copper, zinc, silver, lead and other ores.

### Aniline $C_6H_5NH_2$

**Properties**—A clear, faintly yellow, limpid liquid possessing an aromatic odor. Its purity is guaranteed to be not less than 99.5% and averages about 99.7%. The specific gravity at 15.5°C lies between 1.025 and 1.028, while 95% of the material distills within a range of 15°C, which includes its true boiling-point of 184.4°C. It contains not more than 0.25% of moisture, no hydrogen sulfide and not over 0.10% of nitrobenzene.

**Uses**—There exists a great variety of uses for Du Pont aniline in the dyestuff, textile, rubber and explosive industries. Because it is the highest grade manufactured on a commercial scale, superior results are obtained when it is employed for synthesizing the artificial dyestuffs and other intermediates, as well as when utilized for producing aniline black directly on textile fibers. Rubber goods manufacturers find it highly efficient for accelerating the vulcanization of rubber. Aniline can be converted into several high explosives and also diphenylamine, the stabilizer for military smokeless powders.

### Benzidine (Base) $H_2N \cdot C_6H_4 \cdot C_6H_4 \cdot NH_2$ 4,4'

**Properties**—Can be furnished as a dry powder or in paste form, the latter averaging 55% solids and 45% water. Benzidine (base) has a pale, reddish-purple color with little or no odor. On the dry basis, it assays 98% or higher in purity and possesses a melting-point range of 125° to 127.5°C. The ash content averages 0.7%, but does not exceed 1.5%, the moisture content is less than 1% and there is present from none to only a faint trace of matter insoluble in dilute hydrochloric acid.

**Uses**—Benzidine (base) is employed chiefly for the manufacture of azo dyestuffs.

### Dimethylaniline $C_6H_5N(CH_3)_2$

**Properties**—A pale yellow, transparent liquid having an aromatic odor that is somewhat sharp and offensive. It analyzes not less than 99.5% in purity, has a specific gravity at 15.5°C of 0.956 to 0.958 and freezes slightly above 10°C. The fraction from 5% to 100% distills within a range of 3°C, which includes the true boiling point of 194°C. The product contains no methyl alcohol, methyl chloride or aniline, only a trace of moisture and from none to a maximum of 0.5% monomethylaniline.

**Uses**—The methylene colors, such as Methyl Violet, Methyl Green, Methyl Orange and Methylene Blue as well as Malachite Green and Auramine are derived from dimethylaniline. It is also valuable as a rubber vulcanizing accelerator, for the manufacture of the high explosive, "Tetryl" (trinitrophenylmethylnitramine), and is the source of the important dyestuff intermediate known commercially as Michler's ketone.

### Dinitrobenzene $C_6H_4(NO_2)_2$ 1,3

**Properties**—Light yellow crystals, which possess little or no odor and test not less than 98.5% in purity, there being practically none of the ortho and para isomers present. The minimum freezing-point is 85°C. The product is free from acids, alkalis and oily impurities such as unconverted nitrobenzene. We usually offer dinitrobenzene with a water content of 15 to 20%, this moisture mixing mechanically with the crystals to form small lumps or pellets.

**Uses**—The intermediate is used almost entirely for the manufacture of meta-nitroaniline and meta-phenylenediamine. It has been reported that in the recent war Germany used dinitrobenzene as a shell charge instead of trinitrotoluene or picric acid.

*Continued on Next Page*



**Dinitrotoluene**  $C_6H_4CH_3(NO_2)_2$  1:2:4

**Properties**—Very light yellow monoclinic crystals, at least 95% of which pass a standard 20 mesh screen. The product has a freezing-point of 66° to 68°C, contains not over 0.005% of sulfuric acid; not more than 0.2% of moisture, a maximum of 0.05% ash and is free from oily impurities.

**Uses**—Du Pont dinitrotoluene is recognized as the market standard to which all others are compared. It gives exceptionally satisfactory results when converted into meta-toluylenediamine, which is used for the preparation of azo dyestuffs and sulfur colors. The military high explosive, trinitrotoluene, popularly known as TNT, may be made by the further nitration of dinitrotoluene.

**Diphenylamine**  $(C_6H_5)_2NH$ 

**Properties**—White to slightly yellow crystals having a pleasant aromatic odor. The purity averages 99.5% or higher, while the freezing-point lies between 51.5° and 53°C. It is neutral or slightly alkaline in reaction, does not leave over 0.02% of residue when dissolved in a mixture of alcohol and ether; never contains more than 0.3% of water soluble matter nor more than 0.025% of unconverted aniline. When treated with concentrated sulfuric acid, our diphenylamine produces a clear, colorless or only pale green fluorescent solution.

**Uses**—One of the most important uses for diphenylamine, apart from the synthesis of other intermediates and various dyestuffs such as the Sulfur Blues, Orange IV, Metanil Yellow and Helvetia Blue, is to stabilize military and naval smokeless powders.

**H Acid** (1-Amino-8-Naphthol-3, 6-Disulfonic Acid)

**Properties**—We offer the monosodium salt of H acid, having a molecular weight of 341.3, in dry powdered or paste form, the latter consisting of about 50% solids and 50% water. On the dry basis, the product averages 80% in purity, is completely soluble in a saturated solution of sodium carbonate, and never contains more than a trace of Koch or chromotropic acids. The amount of iron present never exceeds 0.05%, while the bulk of the 20% of foreign matter in the dry material is composed largely of sodium chloride and sodium sulfate.

**Uses**—The consumption of H acid is confined largely to the manufacture of a wide range of important azo dyestuffs.

**Ortho-Toluidine**  $C_6H_4CH_3NH_2$  1:2

**Properties**—The color, odor and physical appearance of this chemical are very similar to those of aniline. The purity ranges from 98 to 99%, the remaining 2 or 1% being composed largely of para-toluidine. The specific gravity at 15.5°C is about 1.003, while the fraction from 5 to 95% distills within less than 1°C, which range includes the true boiling-point of 199.7°C. The commodity is completely soluble in dilute hydrochloric acid, contains no tarry residues, unconverted nitrotoluene or acids and not more than 0.3% moisture.

**Uses**—In addition to the usual consumption of ortho-toluidine in the dye industry for color manufacture, this chemical is also finding considerable favor as an agent for the recovery of ores by the flotation process and as an accelerator for the vulcanization of rubber.

**Para-Nitrotoluene**  $C_6H_4CH_3NO_2$  1:4

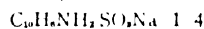
**Properties**—This intermediate occurs in the form of pale yellow crystalline granulations having the characteristic odor of an aromatic nitro compound. The freezing-point is not below 50.5°C, while the melting-point lies between 50.5° and 51.1°C. These values indicate a purity of 98% or higher. It is free from ash, oily impurities and acids, contains not over 0.3% of moisture and from 0.5% to not above 1.5% of ortho-nitrotoluene.

**Uses**—It is used for making para-toluidine, para-nitrobenzaldehyde and para-nitrotoluene-ortho-sulfonic acid, the last of which is the fundamental intermediate for the stilbene colors.

**Para-Toluidine**  $C_6H_4CH_3NH_2$  1:4

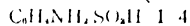
**Properties**—White to light yellowish-brown crystals, which melt not lower than 42.8°C and freeze or congeal at a minimum temperature of 42.5°C. The purity ranges from 98 to 99%, the remaining 2 or 1% of foreign matter being made up chiefly of ortho-toluidine. It is completely soluble in hydrochloric acid, entirely free from ash and oily isomers and never contains over 0.3% of moisture.

**Uses**—Para-toluidine is employed chiefly for making meta-nitro-para-toluidine, dehydrothio-para-toluidine, Primuline, Magenta and several other colors.

**Sodium Naphthionate** (Sodium 1-Naphthylamine-4-Sulfonate)

**Properties**—An exceptionally high-grade product having the formation of nearly colorless to amethyst crystals, which gradually turn light purple in storage. While dry to touch it contains about 22.7% of water of crystallization. An anhydrous sample averages at least 99 to 99.5% in purity and may contain from 0.05 to 0.11% of alpha-naphthylamine. The insoluble matter, comprising calcium and magnesium carbonates, never exceeds and is usually much less than 0.5%.

**Uses**—Du Pont sodium naphthionate may be used with equally good results wherever the best quality naphthionic acid is required. It is consumed in the manufacture of an extensive variety of dyestuffs.

**Sulfanilic Acid** (Para-Aminobenzenesulfonic Acid)

**Properties**—A slate-gray powder guaranteed to have a sulfanilic acid content of at least 97 to 98%. The negligible impurities are mainly 0.2 to 1.0% of aniline sulfate and about 10 to 15% of insoluble matter.

**Uses**—Sulfanilic acid is an ingredient of many azo dyes and may be refined immediately prior to use by forming the sodium salt and filtering.

**Tolidine (Base)** 4:3 H<sub>2</sub>NH<sub>2</sub>C<sub>6</sub>H<sub>4</sub>C<sub>6</sub>H<sub>4</sub>CH<sub>3</sub>NH<sub>2</sub> 3':4'

**Properties**—A slate-gray paste made up of nearly equal percentages of solids and water. On the dry basis, the material tests 95 to 98%, with an ash content of less than 1% to not more than 4%. The ash is chiefly sodium chloride and sodium sulfate. Our tolidine contains none to a faint trace of iron and occasionally very small amounts of complex organic impurities.

**Uses**—Tolidine (base) is used for the same general class of dyes as benzidine. While the tolidine colors are not appreciably faster to fading influences, they are more brilliant and have a bluer shade than those derived from benzidine.

*Continued on Next Page*

**ACIDS AND HEAVY CHEMICALS****SALES DIVISION**

Wilmington, Del.

## Branch Offices

Philadelphia, Pa.      Newark, N. J.  
 3500 Grays Ferry Road      240 Vanderpool Street  
 Telephone Oregon 7950      Telephone Waverly 4670

**PRODUCTS****Acids****Alums****Heavy Chemicals****ACIDS****Acetic Acid**

Commercial, Redistilled, Pure and Glacial.  
 All strengths, in barrels and carboys.

**Dipping Acid**

In carboys (special formulas, if desired).

**Muriatic Acid**

All strengths, in carboys and tanks.

**Nitric Acid**

All strengths, in carboys.

**Aqua Fortis**

All strengths, in carboys.

**Sulfuric Acid**

All strengths.

**Oil of Vitriol (Sulfuric Acid 66%).**

In tank cars, drums and carboys.

**Oleum**

All strengths up to 65% free  $\text{SO}_3$ .

**Electrolyte (Storage Battery Acid).**

Guaranteed to be made from pure brimstone Sulfuric Acid and distilled water. All strengths, in carboys.

**Mixed Acid**

Upon specifications.

**Battery Solutions**

For Lee-Fuller or other batteries.

Lactic Acid—22%, 44% Dark, 22%, 44% and 75% Light (by weight) and Edible 50% (by volume). Special Light Refined, Light Refined, Dark Commercial and Edible.

The very best products manufactured.

For use in the leather, textile, food and other industries, and many other purposes which will be explained on application.

**ALUMS****Crystal Potash, U.S.P.**

Lump, Ground and Powdered.

**Crystal Ammonia, U.S.P.**

Lump, Ground and Powdered.

Also special makes of Alums for color-makers, paper-makers, etc.

**Filter Alum**

For use in any make of mechanical filter. In municipal water works, Du Pont Concentrated Filter Alum (22%  $\text{Al}_2\text{O}_3$ ) is specified wherever waters of high turbidity and low alkalinity present unusual filtration problems.

**Pearl Alum****Pickle Alum****Porous Alum**

Iron-free, lump and ground.

**Sizing Alum****Sulfate of Alumina**

In barrels and bags.

All the commercial grades and strengths, as well as specially concentrated products, containing 22%  $\text{Al}_2\text{O}_3$  equivalent to 73% Sulfate of Alumina, of which we are the sole manufacturers.

**MISCELLANEOUS PRODUCTS****Acetate of Lead (Sugar of Lead)**

White and Brown.

**Acetate of Soda**

Granulated and Crystal.

**Aqua Ammonia**

All strengths, in drums and carboys.

**Barium Chloride****Barium Nitrate****Bauxite****Bichromate of Soda****Distilled Water**

For storage batteries or any other purpose where a pure water is required

**Nitrite of Soda**

Noted for its quality and evenness of strength and color.

**Salt Cake****Strontium Nitrate****Strontium Carbonate****CHEMICAL PRODUCTS DIVISION**

Wilmington, Del.

**PRODUCTS****Amyl Acetate****Refined Fusel Oil****Ethyl Acetate****Ether, U.S.P.****Ether, Anesthesia****Ether, Laboratory****Pyroxylin****Pyroxylin Solutions, including**

Aeroplane Dope

Base Solutions

Bronzing Liquids

Collodion, U.S.P.

Collodion, U.S.P., Flexible

Enamels

Lacquers, for wood or metal

Leather Substitute Solutions

Mantle Dips

Patent Leather Solutions

Split Leather Solutions

**Bronze Powder.**

# THE EAGLE-PICHER LEAD COMPANY

208 SOUTH LASALLE ST., CHICAGO, ILL.



Cincinnati, O.  
New York, N. Y.  
Philadelphia, Pa.  
Baltimore, Md.

## BRANCH AND SALES OFFICES

Buffalo, N. Y.  
Pittsburgh, Pa.  
Cleveland, O.  
St. Louis, Mo.  
Kansas City, Mo.

Minneapolis, Minn.  
Detroit, Mich.  
New Orleans, La.  
Joplin, Mo.

Cable Address  
'EAGLE-PICHER', Chicago  
Codes  
ABC, 5th Edition  
Bentley's

## PLANTS

Cincinnati, O. Chicago, Ill. St. Louis, Mo. Joplin, Mo. Newark, N. J.  
Galena, Kan. Henryetta, Okla. Hillsboro, Ill. Argo, Ill.

## PRODUCTS

### Lead Pigments (Dry)

Corroded White Lead (Old Dutch Process)  
Sublimed White Lead  
Sublimed Blue Lead  
Litharge  
Red Lead  
Orange Mineral  
Special Lead Oxides

### Lead Pigments ground in Linseed Oil

Corroded White Lead (Eagle Brand)  
Sublimed White Lead (Picher Brand)  
Sublimed Blue Lead (Picher Brand)  
Red Lead (Eagle-Picher Brand)

### Metal Products

Soft Missouri Pig Lead  
Refined Pig Lead  
Antimonial Pig Lead  
Babbitt Metals  
Solders  
Lead Wire and Rod  
Ingot Lead  
Lead Wool  
Lead Bottles  
Sheet Lead  
Lead Pipe and Tubing  
Block Tin Pipe and Tubing  
Tin Wire, Tape and Ribbon  
Slab Zinc

### Miscellaneous

Zinc Oxide  
Lithopone  
Sulfuric Acid, 60° (Tank cars only)

## WHITE LEAD, DRY

Eagle Brand White Lead (Basic Lead Carbonate) is produced by the "Old Dutch Process." It is exceedingly uniform in composition and free from impurities and adulterants.

White Lead is used extensively in Ceramics; the manufacture of Chemical Compounds, Enameled Ware, Paints and Putties, Pharmaceutical Compounds, Rubber, Shade Cloth, Textiles, and Wall Paper.

## WHITE LEAD IN OIL

Eagle Brand White Lead Ground in Pure Raw Linseed Oil is used not only for Painting and Decorating, but also as a Lubricant for Stamp-presses and other similar purposes.

## LITHARGE

Eagle-Picher Litharge is a pure Lead Monoxide, free from other lead oxides.

Litharge is used in the manufacture of Storage Batteries, Glass, Rubber, Insulated Wire, Linoleum, Colors, Inks, Driers, Insecticides, Acid-resisting Cements, Varnishes; in Enameling, Assaying and Cyaniding, and in the Refining of Petroleum Oils.

## RED LEAD

Picher Red Leads (Minimum) are specially pure Oxides of Lead, long favorably known for their uniformity.

Red Lead finds its principal uses in the manufacture of Storage Batteries, Paints, Glass, Enameling, Ceramics, and is also used in the manufacture of Colors, in the Rubber Industry and also in the production of Lead Peroxide.

Red Lead ground in oil (Eagle-Picher Brand) is the most universally used Metal Protective Paint. It is also used as a Pipe and Joint Lute.

## SUBLIMED WHITE LEAD

Picher Sublimed White Lead (Basic Lead Sulfate) is the indispensable ingredient of all Mixed Paints. It is also used in considerable amounts in the Rubber Industry and in production of Oil Cloth, Shade Cloth, etc.

Sublimed White Lead in Oil is particularly adapted for the painting of chemical plants as it is gas resistant, chemically inert and highly rust inhibitive.

## SUBLIMED BLUE LEAD

Picher Sublimed Blue Lead is a fumed product produced exclusively from galena. It is used as the base pigment in the manufacture of Metal Paints and in the Rubber Industry.

Sublimed Blue Lead in Oil is the ideal paint for structural metals. It weathers to a steel-gray color, and is highly gas resistant and unequalled for rust inhibition.

## LITHOPONE

Eagle-Picher Lithopone, Sterling Brand, a very fine white pigment, is an exceptionally uniform product.

Lithopone is used in the production of Paints, Enamels, Linoleum, Shade Cloth and in the Rubber Industry.

## ORANGE MINERAL

Picher Orange Mineral is used in the production of dry colors and paints and in the manufacture of Printing Inks.

# EASTERN TALC COMPANY

45 Milk Street  
BOSTON 9, MASS.

MINES AND MILLS  
Rochester, Vermont  
East Granville, Vermont

RESERVE PROPERTIES  
Cambridge Junction, Vermont  
Johnson, Vermont  
Stockbridge, Vermont

## PRODUCTS

**Talc (Soapstone, French Chalk)**

## DEFINITION

Talc, the mineral, occurs in a solid mass although usually so soft that it can be easily carved with a pen-knife. Chemically it is hydrated magnesium silicate, the ideal being represented by the approximate formula:

Silica ( $\text{SiO}_2$ )	63.5%
Magnesium Oxide ( $\text{MgO}$ )	31.7%
Water of Crystallization ( $\text{H}_2\text{O}$ )	4.8%

In nature, however, there are no deposits of chemically pure Talc. In some certain impurities exist and in others entirely different ones, or in varying amounts. At times these impurities occur as mechanical mixtures and can be removed by mechanical means. The physical formation also varies widely, different deposits showing an essentially granular, foliated, or fibrous construction.

## PRODUCTION METHODS

The large consumption of talc is in the powdered form and production of commercial talc consists principally in reducing the native mineral to greater or less impalpability through various crushing and grinding processes. Air separation and air flotation complete many of the finer grades, these methods having largely superseded bolting.

## CHARACTERISTICS AND USES

Among the chief characteristics of talc are its chemical stability, and its high resistance to the passage of heat and electricity. These properties will doubtless suggest to the chemist many possible uses for which it has up to this time been little or not at all employed both as substitute for other minerals and for certain

organic materials in whole or part. As a filler the general use of talc is probably as extensive as that of any other known mineral. The growth of its adaptation to various uses in many and varied lines of manufacture—in each instance arising from a limited original use for one sole purpose—makes the field for further investigation seem very promising—ceramics, cements, plaster, paints and pigments being suggested. Paper, rubber, and textiles have been gone into extensively with enormous application to all. Various toilet preparations consume considerable quantities.

## ALTERNATIVE TERMS

Soapstone is frequently used as a synonym for talc, particularly the varieties which in powdered form have an unctuous, slippery feel, but the term has no very definite application. In the massive natural form soapstone is a rock composed of various minerals, talc being the principal in most occurrences. "French Chalk" is a term often used in the same connection. This unctuous quality gives to such forms of talc a distinct lubricating value similar to graphite, for which it is often substituted. It is frequently used for lubricating effect where cleanliness is a prime requisite, precluding the use of graphite or oils.

There are still other terms which properly describe only tales of particular characteristics.

## SERVICE

Our Company has cooperated with many manufacturers in working to a successful conclusion new uses for and the adaptation of talc to their processes. We are prepared to extend such cooperation at any time and shall welcome the submission of your problems.

An interesting list of many of the uses for Talc will be found in a general representation on page 1193 of this volume.

# ELECTRO BLEACHING GAS COMPANY

18 EAST 41ST STREET, NEW YORK, N. Y.



Chicago Office 11 South La Salle Street  
Plant, Niagara Falls, N. Y.



## PRODUCT

### Liquefied Chlorine Gas

## MANUFACTURE

As manufactured by this company this is a highly purified chlorine for use in textile, chemical and paper industries, and for the treatment of water and sewage. By refrigeration and compression it is liquefied and placed in containers of a size suitable for the individual requirements of the consumer. The chemical analysis of liquid chlorine shows it to be practically pure chlorine gas.

## ANALYSIS

Chlorine . . . . .	99.80% to 99.99%
Carbon Dioxide . . . . .	0.01% to 0.20%
Air and Oxygen . . . . .	0.00% to 0.10%

## PHYSICAL PROPERTIES

Chlorine is a gas of greenish-yellow color with a pungent odor. Specific gravity of 2.49, atomic weight 35.45. Under a pressure of 6 atmospheres at 0° C. it forms a clear yellow liquid of sp. gr. 1.44. The pressure of the gas varies with the temperature from atmospheric pressure at 31.7° C. to 170 pounds per square inch at a temperature of 60° C. The specific gravity of the liquid decreases from 1.4690 at 0° C. to 1.2000 at 80° C.; the average coefficient of expansion being 0.002260. The latent heat of chlorine is 67.4 calories at 22° C.

Liquid chlorine is shipped in steel cylinders containing approximately 100 and 150 pounds respectively, one ton containers, and in tank-cars holding approximately 30,000 pounds. Where the latter are desired, it is necessary to have proper storage facilities at the plant where the chlorine is to be used.

Liquid chlorine is used for the production of many chemical compounds.

In the textile industry, liquid chlorine is used for bleaching linen; cotton, raw or spun, artificial silk hosiery; knit and print goods. In this industry, the

convenience and simplicity of operation with the far superior results obtained have won for liquid chlorine an enviable reputation.

In the pulp and paper industry, liquid chlorine is extensively used in making bleach liquor, the gas being applied at the base of a small absorption tower through which a milk of lime solution circulates, the chlorine and lime combining to form calcium hypochlorite. Its advantages are rapid settling, with very small sludge losses; increased bleach production with no additional equipment; standard strength solutions; no loss of chlorine in transportation. Operating conditions are simple and agreeable and this process is the logical answer to all troubles encountered in the use of chloride of lime.

Liquid chlorine is employed for the sterilization of public water supplies to eliminate disease producing bacteria, especially those responsible for typhoid fever, also for the disinfection of sewage and of the wastes from hides and skins imported from anthrax infested countries. By the medical fraternity it is used in small ampules for individual use or in standard cylinders for hospitals in the preparation of Carrell-Dakin solutions for the disinfection of wounds.

Metallurgically, liquid chlorine is used in the reduction of cobalt and nickel and the refining of gold and platinum.

Liquid chlorine and its by-products are manufactured in a plant covering over ten acres and containing 228,325 square feet of floor space.

All processes have been brought to a high state of efficiency and the result is a product which for purity, uniformity and effectiveness leaves nothing to be desired, while the vast number of con-

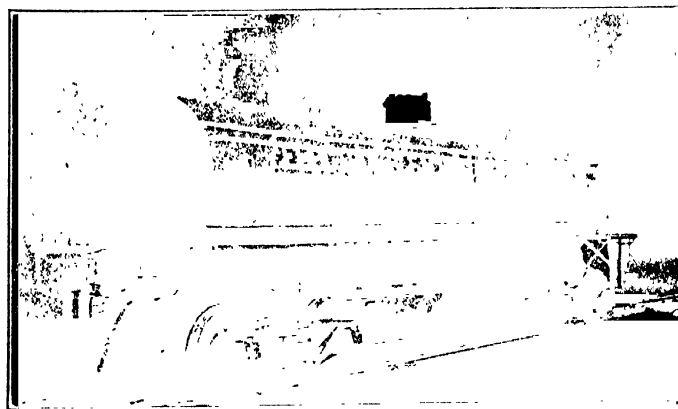
tainers at our disposal and efficient handling facilities place us in a position to render an unapproachable service.

This company maintains a competent technical staff and research laboratory which is at your disposal in furnishing all information concerning the use of this product for any particular purpose.

## INQUIRIES

Address all inquiries to New York Office.

150 LB.  
CYLINDER WITH CAP  
Total Height, 53 in.  
Diameter, 10 1/2 in.



ONE OF OUR FLEET OF LIQUID CHLORINE TANK CARS, CAPACITY 30,000 LB.  
Evidence of our ability to meet large chemical or paper-mill requirements



# THE FRIES & FRIES CO.

1501-1513 W. SIXTH STREET, CINCINNATI, OHIO

BRANCH OFFICE & WAREHOUSE  
212 Pearl Street, New York, N. Y.

Cable Address  
"ROBFRIES", Cincinnati

## PRODUCTS

Synthetic Aromatic Chemicals, Essential Oils, Pyroxylin Solutions, Solvents, Perfumers' Raw Materials, Natural and Synthetic Flavors, Certified Food Colors, True Fruit Flavors, Caramel Coloring.

## SYNTHETIC AROMATIC CHEMICALS

### Ethers and Esters

Amyl Acetate	Isobutyl Acetate
Amyl Butyrate	Isobutyl Butyrate
Amyl Benzoate	Isobutyl Benzoate
Amylphenyl Acetate	Isobutylphenyl Acetate
Amyl Salicylate	Isobutyl Salicylate
Amyl Caproate	Isobutyl Caproate
Amyl Valerate	Isobutyl Valerate
Amyl Propionate	Isobutyl Propionate
Amyl Isobutyrate	Isobutyl Isobutyrate
Amyl Formate	Isobutyl Formate
Benzyl Acetate	Isobutyl Anthranilate
Benzyl Benzoate	Isobutyl Cinnamate
Benzyl Valerate	Methyl Acetate
Benzyl Propionate	Methyl Butyrate
Benzyl Formate	Methyl Benzoate
Benzyl Isobutyrate	Methylphenyl Acetate
Benzyl Butyrate	Methyl Salicylate
Butyl Acetate	Methyl Caproate
Butyl Butyrate	Methyl Valerate
Butyl Benzoate	Methyl Propionate
Butyl Anthranilate	Methyl Isobutyrate
Butylphenyl Acetate	Methyl Formate
Butyl Salicylate	Methyl Anthranilate
Butyl Caproate	Methyl Cinnamate
Butyl Valerate	Methyl Phthalate
Butyl Propionate	Methyl-beta-Naphthol Ether
Butyl Formate	Benzoic Ether
Butyl Isobutyrate	Dibenzyl Ether
Ethyl Acetate	Enanthic Ether
Ethyl Butyrate	Geranyl Acetate
Ethyl Benzoate	Geranyl Formate
Ethylphenyl Acetate	Linalyl Acetate
Ethyl Salicylate	Linalyl Formate
Ethyl Caproate	Methylheptin Carbonate
Ethyl Valerate	Neroline
Ethyl Propionate	Rum Ether, A.
Ethyl Isobutyrate	Rum Ether, H.
Ethyl Formate	Rum Ether, Technical Absolute
Ethyl Anthranilate	Terpinyl Acetate
Ethyl Cinnamate	Terpinyl Formate
Ethyl Phthalate	Yara-Yara
Ethyl-beta-Naphthol Ether	

### Acids

Cinnamic	Isobutyric
Butyric	Phenylacetic
	Valeric

### Alcohols

Benzyl Alcohol	Linalool
Citronellol	Nerol
Geraniol (from Citronella)	Rhodinol, F. & F.
Geraniol (from Palma rosa)	Rhodinol, F.
Geraniol (from Bourbon Geranium)	Rhodinol, T.
	Rhodinol, No. 1
	Rhodinol, S.

## Aldehydes and Ketones

Acetophenone	Isobutyric Aldehyde
Anisic Aldehyde	Methyl Acetophenone
Anisole (Phenylmethyl Ether)	Phenylacetaldehyde
Butyraldehyde	Violet Ketone, A.
Cinnamic Aldehyde	Violet Ketone, B.
Citral	Violet Ketone, Alpha-beta
Citronellal	Valeraldehyde

## TRUE FRUIT FLAVORS

These flavors, of which we offer two distinct qualities, fill a demand that had long been insufficiently satisfied. These products are rich in flavor and aroma, and they will produce the most satisfactory results desired.

## ESSENTIAL OILS, TERPENELESS

Lemon	Lime, Redistilled
Lemon, Redistilled	Orange
Lemon, Sesquiterpeneless	Orange, Redistilled
Lime	Orange, No. 40
	Orange, Sesquiterpeneless

## CERTIFIED FOOD COLORS

### Peerless, Powdered

Lemon Yellow	Strawberry Red
Golden Yellow	Brilliant Rose
Egg Yellow	Chocolate Brown
Brilliant Orange	Brilliant Green
Blood Orange	Mint Green
Burgundy Red	Grape Shade
Cherry Red	Bright Blue
Raspberry Red	Violet

## CARAMEL, BURNT SUGAR COLORING

Liquid, will not deposit under most severe acid test, nor in alcoholic solutions up to 52½% or 105 proof. Of exceptional coloring power and brilliancy. Carload shipments if desired.

## SERVICE

We are practically always in a position to ship orders, regardless of size, the same day received. We give the same careful attention to small orders as to large ones, and will accept orders for any size package from one ounce up.

**Laboratory**—Our Laboratory is at your service for developing flavors, odors or other items for your individual requirements. Therefore, we shall be pleased to receive your inquiries for articles not mentioned which we may be in a position to manufacture.

## PRICE LIST

We shall be pleased to forward our latest price list on request. It contains a complete listing of the various flavors, colors, etc., that we produce.

# THE GASKILL CHEMICAL CORPORATION

Manufacturing Chemists

GENERAL OFFICE AND WORKS

Telephones  
WILLIAMSBURG 1763  
WILLIAMSBURG 4990

157-159 SPENCER STREET, BROOKLYN, N. Y.

SOLE SALES AGENTS

NATIONAL GUM & MICA CO., 59TH STREET AND 11TH AVENUE, NEW YORK, N. Y.



Trade Mark

## PRODUCTS

Organic Chemicals and Intermediates

"Rodol" Fur Dyes

"Rodol" Animal Fiber Dyes

## ORGANIC CHEMICALS AND INTERMEDIATES

Para-Phenylenediamine

Distilled Lumps

Crystals

Distilled Crystals

Para-Phenylenediamine Hydrochloride

Ortho-Aminophenol

Nitro-meta-Diaminoanisole

Nitro-meta-Toluenediamine

Para-Aminophenol

Base

Hydrochloride

Acetyl-para-Phenylenediamine

## FUR DYES

"Rodol" AA

"Rodol" A

"Rodol" Gray B

"Rodol" Gray CD

"Rodol" D

Regular Lumps

Distilled Lumps

Distilled White Crystals

"Rodol" GG

"Rodol" 4G

"Rodol" DB

"Rodol" DG

"Rodol" Gray RB

"Rodol" SA

"Rodol" X

Loose Crystals

The "Rodol" brand of Fur Dyes has been fully developed by this company, including all the dyes of Aniline origin which are in demand among average dyers as well as several specially manufactured dyes. In respect of the latter, the shades and colors are **fast**, will not fade or rub out; and these Dyes should be used in accordance with our practical suggestions.

"Rodol" Dyes, after extensive experiments with various colorings extended over several years, retain their original shades; the results will always be identical; and they are **guaranteed to be pure goods** in all cases.

Tests—In the table below are comparison tests or dyeings on the different mordants; these should assist the prospective buyer in the selection of the particular dye required and to determine the necessity for the use of a mordant before or after the bath of the skin in the dye.

Prices and Samples—Sent upon application.

## ANIMAL FIBER DYES

Sky Blue

Pansy Blue

Blue Black

Jet Black

Sable Brown

Stone Marten Brown

Taupe

Olive Drab

Blue Gray

Greenish Gray

Mouse Gray

Bright Yellow

Dull Yellow

"Rodol" Animal Fiber Dyes dye Furs, Feathers, Hatter's Fur, and Silk in a cold bath by process of oxidation.

We have successfully worked out blends which give natural colors, characteristic in every respect with nature's own coloring found on animals and birds, all of which can be produced on Fur, Feathers, Hatter's Fur, and Silk.

"Rodol" Dyes are made in the U. S. A. They are unequalled in quality, and cheapest in use.

## COOPERATIVE SERVICE

We operate a confidential manufacturing service which is at the disposal of our customers, free of all costs. Full manufacturing information will be extended to interested persons by our Chemists, through whom all dyeing problems receive prompt consideration without obligation.

COMPARISON OF DIRECT AND MORDANTED DYEINGS

"Rodol" Brand Fur Dyes	Copper Mordant	Chrome Mordant	Copperas Mordant	Direct Dyeings
"Rodol" AA	Blue Black		Coal Black	Blue Black
"Rodol" A	Blue Black			Blue Black
"Rodol" D	Coal Black	Brown Black	Coal Black	Brownish Black
"Rodol" 2G	Yellow Brown	Yellow Brown	Yellow Brown	Dull Yellow
"Rodol" 4G	Light Brown	Light Brown	Red Brown	Pure Yellow
"Rodol" Gray RB	Brownish Gray	Greenish Gray	Mouse Gray	
"Rodol" P	Dark Brown	Red Brown	Gray Brown	Light Brown
"Rodol" Pyrogallie Acid	Yellow Brown	Yellow Brown	Gray Brown	Blond

# GENERAL CHEMICAL COMPANY

25 BROAD STREET, NEW YORK, N. Y.

Baltimore, Md.  
Buffalo, N. Y.

Chicago, Ill.  
Denver, Colo.

BRANCH OFFICES  
Easton, Pa.  
Philadelphia, Pa.  
Cleveland, O.

Pittsburgh, Pa.  
Providence, R. I.

San Francisco, Calif.  
Seattle, Wash.

Cable Address  
"LYCURGUS," New York

Montreal, Canada  
The Nichols Chemical Co., Ltd.

## PRODUCTS

### Heavy Chemicals

### ACIDS

Acetic: All strengths of Commercial, Pure, Re-distilled grades. Glacial 99½% U. S. P.  
Aqua Fortis.  
Arsenic.  
Battery. See Electrolyte.  
Butyric.  
Chlorosulfonic.  
Electrolyte: A specially pure battery acid made by the Contact Process System.  
Hydrochloric (Muriatic). Commercial and Chemically Pure.  
Hydrofluoric (Also White Acid for frosting glass).  
Hydrofluosilicic.  
Mixed: Sulfuric and Nitric. Various formulas.  
Nitric: Commercial and Chemically Pure.  
Phosphoric.  
Propionic 99¼%.  
Sulfuric: Oil of Vitriol; Oleum (Fuming) and Chemically Pure in carboys, drums, tank-trucks and tank-cars.  
Valeric: Iso and Normal.

### ALUMS

Ammonia Alum, U. S. P. (Ammonium-Aluminum Sulfate): Lump, Ground or Powdered form.  
Sodium-Aluminum Sulfate.  
Sulfate of Alumina.

### ALUMINUM SULFATE

Lump, Ground, and Filter.

### AMMONIA

Aqua in carboys and drums.  
Bifluoride.  
Hydrate. Chemically Pure.

### BAKER AND ADAMSON

"B & A" Chemically Pure Reagents for Laboratories.

### COPPER

Nitrate.  
Sulfate (Blue Vitriol).

### DIMETHYL SULFATE

### INSECTICIDES

B. T. S.  
Atomic Sulfur.  
Arsenate of Lead.  
Arsenate of Calcium.  
Arsenite of Zinc.  
Bordeaux Mixture.  
Cattle Dip.

### IRON

Nitrate: Copperas, True.  
Sulfate (Copperas).  
Sulfide: Commercial Lump, and for Laboratory generation of H<sub>2</sub>S.

### LEAD ACETATE

Broken, Crystal and Powder.

### MAGNESIUM

Fluosilicate (Solution).  
Sulfate (Epsom Salt): U. S. P. and Technical.

### SODIUM

Acetate.  
Bisulfate (Niter cake).  
Bisulfite: Anhydrous, Powder and Solution.  
Fluoride.  
Hyposulfite: Crystal, Granular, Photographic grades.  
Phosphate, Disodium.  
Phosphate, Trisodium.  
Pyrophosphate.  
Silicate: Solid and Solution.  
Sulfate: Salt Cake and Glauber's Salt.  
Sulfide: Chipped Patented 60-62% and Crystals 30-31%.  
Sulphite: Crystal and Dry powdered.

### SULFUR

Flour.  
Flowers.  
Roll (Brimstone).

### TIN

Bichloride.  
Crystals (Stannous chloride).  
Murate.  
Tetrachloride Anhydrous.

### SERVICE

Our works and distributing warehouses are so located in various sections of the country that prompt service can be obtained at a minimum freight expense. **INQUIRIES** should be addressed to the nearest sales office.

**EXPORT** inquiries should be addressed to

GENERAL CHEMICAL COMPANY,

Export Department,  
25 Broad Street,  
New York, N. Y., U. S. A.



# THE GASKILL CHEMICAL CORPORATION

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Trade Mark

## PRODUCTS

Organic Chemicals and Intermediates

"Rodol" Fur Dyes

"Rodol" Animal Fiber Dyes

## ORGANIC CHEMICALS AND INTERMEDIATES

Para-Phenylenediamine

Distilled Lumps

Crystals

Distilled Crystals

Para-Phenylenediamine Hydrochloride

Ortho-Aminophenol

Nitro-meta-Diaminoanisole

Nitro-meta-Toluenediamine

Para-Aminophenol

Base

Hydrochloride

Acetyl-para-Phenylenediamine

## FUR DYES

"Rodol" AA

"Rodol" A

"Rodol" Gray B

"Rodol" Gray CD

"Rodol" D

Regular Lumps

Distilled Lumps

Distilled White Crystals

"Rodol" GG

"Rodol" 4G

"Rodol" DB

"Rodol" DG

"Rodol" Gray RB

"Rodol" SA

"Rodol" X

Loose Crystals

The "Rodol" brand of Fur Dyes has been fully developed by this company, including all the dyes of Aniline origin which are in demand among average dyers as well as several specially manufactured dyes. In respect of the latter, the shades and colors are **fast**, will not fade or rub out; and these Dyes should be used in accordance with our practical suggestions.

"Rodol" Dyes, after extensive experiments with various colorings extended over several years, retain their original shades; the results will always be identical; and they are **guaranteed to be pure goods** in all cases.

Tests—In the table below are comparison tests or dyeings on the different mordants; these should assist the prospective buyer in the selection of the particular dye required and to determine the necessity for the use of a mordant before or after the bath of the skin in the dye.

Prices and Samples—Sent upon application.

## ANIMAL FIBER DYES

Sky Blue

Pansy Blue

Blue Black

Jet Black

Sable Brown

Stone Marten Brown

Taupe

Olive Drab

Blue Gray

Greenish Gray

Mouse Gray

Bright Yellow

Dull Yellow

"Rodol" Animal Fiber Dyes dye Furs, Feathers, Hatter's Fur, and Silk in a cold bath by process of oxidation.

We have successfully worked out blends which give natural colors, characteristic in every respect with nature's own coloring found on animals and birds, all of which can be produced on Fur, Feathers, Hatter's Fur, and Silk.

"Rodol" Dyes are made in the U. S. A. They are unequalled in quality, and cheapest in use.

## COOPERATIVE SERVICE

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COMPARISON OF DIRECT AND MORDANTED DYEINGS

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"Rodol" 2G	Yellow Brown	Yellow Brown	Yellow Brown	Dull Yellow
"Rodol" 4G	Light Brown	Light Brown	Red Brown	Pure Yellow
"Rodol" Gray RB	Brownish Gray	Greenish Gray	Mouse Gray	
"Rodol" P	Dark Brown	Red Brown	Gray Brown	Light Brown
"Rodol" Pyrogallie Acid	Yellow Brown	Yellow Brown	Gray Brown	Blond

# HARMON COLOR WORKS, INC.

Manufacturers of Chemical Pigment Colors  
COLLEGE POINT, NEW YORK, N. Y.

Cable Address  
"HARPOINT", New York

## PRODUCTS

### Chemically Pure Greens

LLL  
LL  
L  
M  
D  
DD

### Harpoint Grinding Greens

LL  
L  
M  
D  
DD

### Harpoint Grinding Greens No. 2

LL  
L  
M  
D  
DD

### Export Greens

L  
M  
D

### Chemically Pure Yellows

LLL  
LL  
L  
M  
O  
DO  
DDO

### Reduced Grinding Yellows

L  
M  
O

### Export Yellows

L  
M  
O

### Chemically Pure Blues

Prussian  
Chinese  
Bronze  
Milor  
Soluble

### Para Reds

Toners  
Reduced Paras

### Vermilions

Special shades of all type colors made to order.

## QUALITY

Harmon Chemical Pigment Colors are fully guaranteed as to uniformity and tinctorial strength. They are invariably clear and brilliant, as well as free from impurities.

## USES

Our colors are used in products such as:

Auto Paints	Kalsomine
Barrel Paints	Leather
Bicycle Paints	Leather Dressings
Bluing	Lamoleum
Bridge Paints	Lithographic Inks
Carbon Paper	Maring Paints
Coated Paper	Oil-Cloth
Colors in Japan	Oil Stains
Colors in Oil	Pencils
Crayons	Porch Paints
Deck Paints	Printing Inks
Enamel Paints	Mechanical Rubber
Enameling Paints	Shade Cloth
Flat Wall Paints	Shoe Polish
Floor Paints	Shingle Stains
Floor-coverings	Ship Paints
House Paints	Textiles
Implement Paints	Tin Plate
Iron and Steel Paints	Wagon Paints
	Wall Paper

## PRODUCTION

Our Pigment Colors are produced by formulas which have been thoroughly tested by many years of successful use after careful standardization.

## COLOR-MATCHING

Our complete facilities for color-matching are always available for use by our customers. Any color or shade can be duplicated by means of these facilities.

## SERVICE

We are constantly adding new colors to our line and solicit your inquiries regarding any products not mentioned specifically. Our well equipped laboratories are at your service, and your problems are welcomed. This laboratory service, as well as samples and quotations, are gladly furnished without obligation.

## STOCKS AND SHIPMENTS

We maintain sufficiently large stocks to make prompt shipments at all times. We use the standard packages, but shall be glad to arrange for the use of special sizes on request.

# THE GASKILL CHEMICAL CORPORATION

Manufacturing Chemists

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# THE HELLER & MERZ COMPANY

MAIN OFFICE: 505 HUDSON STREET, NEW YORK, N. Y.



## BRANCHES

Boston, Mass., 247 Atlantic Ave.  
Chicago, Ill., 109 West Austin Ave.  
Philadelphia, Pa., 114 Market St.  
Springfield, Mass., 24 Lester St.

Cable Address  
"MERZ", New York  
Codes  
ABC, 5th & 6th Editions  
Directory  
Bentley's  
Lieber's

## PRODUCTS

Ultramarines  
Barrel Paints  
Pigment Colors  
Coal-tar Colors

## ULTRAMARINE DEPT.

Ultramarine Blue Powder  
Ultramarine Blue Pulp  
Ultramarine Blue Drops  
Ball Blue  
Square Blue

## BARREL PAINT DEPT.

Paste  
Liquid  
Dry

## PULP DEPT.

Pigment Colors in paste form

## SUNDRIES

Sap Brown  
Oxide of Iron  
Ochre  
Pigment Black  
Umber  
Sienna  
Soluble Blue

## ANILINE DEPT.

Acid Colors  
Basic Colors  
Direct Colors  
Colors Soluble in Oil  
Butter Color  
Beta-Naphthol  
Sulphanilic Acid

We are the Pioneer manufacturers on this continent of

Bromo Fluorescein  
Eosine  
Erythrosine  
Phloxine  
Rose Bengale

Our standards are second to none.

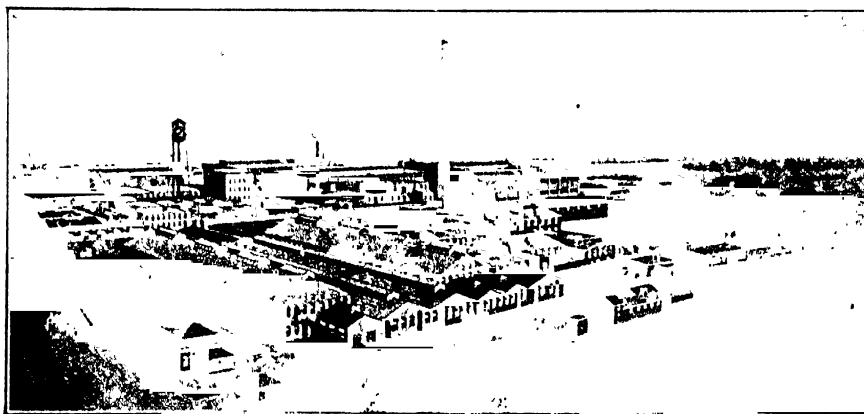
## GUARANTEE

We guarantee our goods to be of highest quality and to run entirely uniform.

## SERVICE

Half a century's experience enables us to satisfy the wants of consumers.

The service of our laboratories in Newark, N. J., and New York and of our demonstrators is unexcelled.



WORKS OF THE HELLER & MERZ CO., NEWARK, N. J.

# THE GASKILL CHEMICAL CORPORATION

Manufacturing Chemists

GENERAL OFFICE AND WORKS

Telephones  
WILLIAMSBURG 1763  
WILLIAMSBURG 4990

157-159 SPENCER STREET, BROOKLYN, N. Y.

SOLE SALES AGENTS

NATIONAL GUM & MICA CO., 59TH STREET AND 11TH AVENUE, NEW YORK, N. Y.



Trade Mark

## PRODUCTS

Organic Chemicals and Intermediates

"Rodol" Fur Dyes

"Rodol" Animal Fiber Dyes

## ORGANIC CHEMICALS AND INTERMEDIATES

Para-Phenylenediamine

Distilled Lumps

Crystals

Distilled Crystals

Para-Phenylenediamine Hydrochloride

Ortho-Aminophenol

Nitro-meta-Diaminoanisole

Nitro-meta-Toluenediamine

Para-Aminophenol

Base

Hydrochloride

Acetyl-para-Phenylenediamine

## FUR DYES

"Rodol" AA

"Rodol" A

"Rodol" Gray B

"Rodol" Gray CD

"Rodol" D

Regular Lumps

Distilled Lumps

Distilled White Crystals

"Rodol" GG

"Rodol" 4G

"Rodol" DB

"Rodol" DG

"Rodol" Gray RB

"Rodol" SA

"Rodol" X

Loose Crystals

The "Rodol" brand of Fur Dyes has been fully developed by this company, including all the dyes of Aniline origin which are in demand among average dyers as well as several specially manufactured dyes. In respect of the latter, the shades and colors are **fast**, will not fade or rub out; and these Dyes should be used in accordance with our practical suggestions.

"Rodol" Dyes, after extensive experiments with various colorings extended over several years, retain their original shades; the results will always be identical; and they are **guaranteed to be pure goods** in all cases.

Tests—In the table below are comparison tests or dyeings on the different mordants; these should assist the prospective buyer in the selection of the particular dye required and to determine the necessity for the use of a mordant before or after the bath of the skin in the dye.

Prices and Samples—Sent upon application.

## ANIMAL FIBER DYES

Sky Blue

Pansy Blue

Blue Black

Jet Black

Sable Brown

Stone Marten Brown

Taupe

Olive Drab

Blue Gray

Greenish Gray

Mouse Gray

Bright Yellow

Dull Yellow

"Rodol" Animal Fiber Dyes dye Furs, Feathers, Hatter's Fur, and Silk in a cold bath by process of oxidation.

We have successfully worked out blends which give natural colors, characteristic in every respect with nature's own coloring found on animals and birds, all of which can be produced on Fur, Feathers, Hatter's Fur, and Silk.

"Rodol" Dyes are made in the U. S. A. They are unequalled in quality, and cheapest in use.

## COOPERATIVE SERVICE

We operate a confidential manufacturing service which is at the disposal of our customers, free of all costs. Full manufacturing information will be extended to interested persons by our Chemists, through whom all dyeing problems receive prompt consideration without obligation.

COMPARISON OF DIRECT AND MORDANTED DYEINGS

"Rodol" Brand Fur Dyes	Copper Mordant	Chrome Mordant	Copperas Mordant	Direct Dyeings
"Rodol" AA	Blue Black		Coal Black	Blue Black
"Rodol" A	Blue Black			Blue Black
"Rodol" D	Coal Black	Brown Black	Coal Black	Brownish Black
"Rodol" 2G	Yellow Brown	Yellow Brown	Yellow Brown	Dull Yellow
"Rodol" 4G	Light Brown	Light Brown	Red Brown	Pure Yellow
"Rodol" Gray RB	Brownish Gray	Greenish Gray	Mouse Gray	
"Rodol" P	Dark Brown	Red Brown	Gray Brown	Light Brown
"Rodol" Pyrogallie Acid	Yellow Brown	Yellow Brown	Gray Brown	Blond



# MORRIS HERRMANN & CO.

Dry Color Makers

200 FIFTH AVENUE, NEW YORK, N. Y.

Cable Address  
"RUNRUN", New York  
WORKS  
Newark, N. J.

## PRODUCTS

Dry Pigment Colors, Lakes, Pulp Colors, Paris  
Green, Earth Colors.

### DRY PIGMENT COLORS

#### Blues

American  
Bronze  
Celestial  
Cerulean  
Chinese  
Iridescent  
Milori  
Prussian  
Soluble  
Turquoise

#### Greens

C. P.  
Grinders'  
Jobbers'  
Limeproof  
Paris

#### Yellows

C. P.  
Commercial  
Limeproof

#### Reds

Para  
Process  
Toluidine  
Turkey  
Lithol

#### Scarlets

#### Vermilions

English  
American  
Eosine  
Para

#### Toners

Para  
Toluidine  
Lithol  
Scarlet  
Maroon  
Bronze Red  
Bronze Green  
Blue

#### Whites

Alumina Hydrate  
Gloss White

#### Lakes

Geranium  
Green  
Blue  
Yellow  
Orange  
Purple  
Madder  
Mauve  
Rose  
Brown  
Transparent (all shades)  
Chambertin  
Jacque  
Maroon  
Lithol  
Violet  
Crimson  
Carriage

#### Pulp Colors

All of the above also made in pulp form

#### Earth Colors

French Ocher  
Van Dyke Brown  
Raw Sienna  
Burnt Sienna

## USES

For Paint, Varnish and Printing Ink Manufacturers.

#### Also for

Enamels  
Stains  
Kalsomine  
Artist Tube Colors  
Lithographing Inks  
Marking Inks  
Celluloid  
Candles  
Lead Pencils  
Crayons  
Rubber  
Paper  
Carbon Paper  
Typewriter Ribbons  
Cosmetics  
Laundry  
Sealing Wax  
Lacquer  
Artificial Leather  
Oil Cloth, Linoleum  
Scenic

## QUALITY

Our aim continues to be the maintenance of the highest quality, which we believe means the greatest advantage to the consumer.

# HEYDEN CHEMICAL COMPANY OF AMERICA, INC.

Manufacturers of Fine Chemicals for Medicinal and Technical Use

Cable Address  
HEYDEN New York

Codes  
A. B. C. 5th Edition  
Western Union  
Bentley's  
Lieber's

GENERAL OFFICES, RESEARCH LABORATORIES AND WORKS

GARFIELD, N. J.

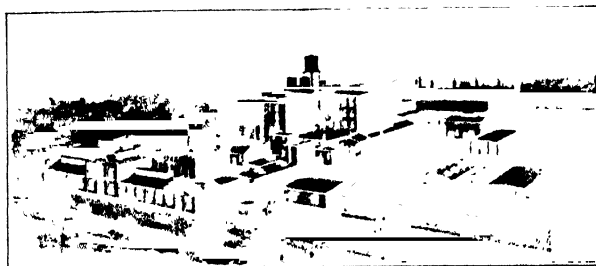
BRANCH OFFICES

New York, 115 William Street  
Chicago, 150 North Market Street  
Philadelphia, 1410 North Front Street  
St. Louis, 229 South Commercial Street  
Kansas City, Mo., 2932 Fairmont Avenue

## PRODUCTS

Acetanilide, U. S. P.  
Acetic Anhydride  
Acetone, U. S. P.  
Acid Acetic  
Acid Acetylsalicylic  
Acid Benzoic, U. S. P. (from Toluol)  
Acid Carbolic, U. S. P. (Phenol)  
Acid Hydrochloric (Muriatic)  
Acid Lactic, U. S. P.  
Acid Nitric, C. P.  
Acid Salicylic, U. S. P., Synthetic  
Acid Sulphuric  
Acid Tannic  
Acid Tartaric  
Alum, Burnt  
Alum, Chrome  
Aluminum Acetate  
Aluminum Sulphate, Granular, U. S. P.  
Ammonia Water  
Ammonium Bromide, U. S. P.  
Ammonium Salicylate, U. S. P.  
Amyl Salicylate, U. S. P.  
Antimony Trichloride  
Barium Carbonate  
Bismuth Beta-naphthol, U. S. P.  
Bismuth Subsalicylate, U. S. P.  
Butter of Antimony (Antimony Trichloride)  
Calcium Lactate  
Calcium Salicylate, U. S. P.  
Calomel, U. S. P.  
Calomel Ointment  
Collargol (Colloidal, soluble Metallic Silver)  
Creosote, U. S. P.  
Creosote Carbonate, U. S. P.  
Creosotal (Creosote Carbonate)  
Crystalline  
Duotal (Guaiacol Carbonate, Heyden)  
Epsom Salt (Magnesium Sulphate)  
Formaldehyde, U. S. P.  
Fusel Oil (Amyl Alcohol)  
Garantose

Gastrosan (Bisalicylate of Bismuth)  
Gold Extender  
Guaiacol, U. S. P.  
Guaiacol Carbonate, U. S. P.  
Hexamethylenetetramine, U. S. P.  
Ichthynat (Ammonium Ichthynatum)  
Injection Heyden  
Lead Acetate  
Lithium Benzoate  
Lithium Salicylate, N. F.  
Magnesium Salicylate  
Menthol, U. S. P.  
Mercury, Commercial  
Methyl Salicylate, U. S. P. (Synthetic Oil Wintergreen)  
Oil Betula (Oil Sweet Birch)  
Oil Wintergreen Synthetic (Methyl Salicylate)  
Omorol  
Orphol (Bismuth Beta-naphthol)  
Paraformaldehyde, U. S. P. (Trioxymethylene)  
Paraldehyde, U. S. P.  
Phenol  
Phenyl Salicylate (Salol), U. S. P.  
Potassium Chlorate  
Potassium Permanganate, U. S. P.  
Potassium, Sulphuretted  
Proganol-Heyden  
Prophylactic Tubes  
Resorcinol, U. S. P. (Resorcin)  
Saccharine, U. S. P.  
Salocreol  
Salol, U. S. P.  
Sodium Benzoate, U. S. P.  
Sodium Bromide, U. S. P.  
Sodium Fluoride  
Sodium Iodide, U. S. P.  
Sodium Salicylate  
Strontium Bromide, U. S. P.  
Strontium Iodide, U. S. P.  
Strontium Salicylate, U. S. P.  
Tartar Emetic, U. S. P.  
Unguentum Crede  
Vargol-Heyden



GENERAL OFFICES, RESEARCH LABORATORIES AND WORKS, GARFIELD, N. J.

# HEYL LABORATORIES, INC.

437 BARRETTO STREET, NEW YORK, N. Y.

Cable Address "HEYLABS", New York

## PRODUCTS

Indicators, Standardized  
Biological Stains, Certified  
Medicinal Dyes  
Vital Stains  
Organic Preparations  
Commercial Dyes

## QUALITY

Heyl products are manufactured from the best grade of materials in a thoroughly and completely equipped laboratory under the supervision of expert and specially trained chemists.

All products are tested both biologically and microscopically. Their purity, quality, uniformity and dependability are guaranteed.

The user of Stains, Indicators and other products employed in laboratory work realizes that upon the purity, uniformity and dependability of such material depends the accuracy and authority of results obtained.

The manufacture of such products requires, first of all, purity of raw material. It demands knowledge and experience on the part of the chemists engaged in this special field. The manufacture of such products is not by any means or in any way comparable with the manufacture of dyestuffs for commercial use. The statement is sometimes made by dealers that there is no standard method of testing such products other than by actual use. That statement is contrary to fact.

Heyl Laboratories, Inc., products can be absolutely relied upon. They are the practical result of a successful attempt to specialize in the manufacture of such materials for biological use.

## STANDARDIZED INDICATORS

Alizarin Red S	Iodine Eosin
Azolitmine	Lacmoid, Alcohol soluble
Benzopurpurine	Lacmoid, Water soluble
Cochineal	Litmus
Congo Red	Methyl Orange
Coralline Red	Methyl Red
Dimethylaminoazobenzene	Methyl Violet
Dimethylaminobenzaldehyde	Naphthylamine Hydrochloride, Alpha
Dimethylglyoxime	Neutral Red
Diphenylamine	Phenylhydrazine
Eosin B	Phenylhydrazine Hydrochloride
Eosin Y	Phenolphthalein
Fluorescein	Sodium Nitroprusside
Fuchsin, Acid	Tropaeolin
Hematoxylin, C. P. Crystals	

These Indicators are produced from raw materials which we either manufacture ourselves or purify from commercial products. They are carefully standardized and will meet every need of the analytical chemist.

Additional Indicators will be added to our line as necessity for them arises. Special Indicators will be prepared to order.

We supply our crystallized, standardized indicators in 10 gram and 25 gram bottles. Aqueous and alcoholic solutions prepared on request.

## ORGANIC PREPARATIONS

We are producing a special line of exceptionally pure, synthetic, organic compounds for biological work, such as Benzidine, Benzophenone, Dulcin, Glycogen, Monomethylaniline, Para-phenylenediamine, etc. What are your needs?

## BIOLOGICAL STAINS, CERTIFIED

Alizarin Red S	Dahlia Violet
Auramine	Eosin Y
Benzopurpurine	Erythrosin
Biebrich Scarlet	Fuchsin, Acid
Biorupine	Fuchsin, RFN, Basic
Bismarck Brown	Gentian Violet
Brilliant Cresyl Blue	Indigo Carmine
Brilliant Green	Methyl Green
Carminate Ammonium	Methyl Violet
Carminate Sodium	Methylene Blue BG
China Blue	Neutral Red
Chrysoidine	Safranin O
Crystal Violet	Thionine

The important uses to which Biological Stains are put justify the extreme care with which we manufacture them, as well as the accuracy of our standardization.

Heyl Certified Biological Stains have, since being placed on sale about five years ago, gained for themselves a well-founded reputation for uniformity, brilliancy and extremely low ash content, the latter signifying the absence of more than traces of metal salts or fillers, insuring even and accurate results.

We do not certify any Biological Stain until we have assured ourselves by exhaustive tests that they are suitable for the purpose intended. Those interested may obtain from us copies of the standardization technique used.

We are in a position to produce other Biological Stains at short notice. Let us know your needs.

Heyl Laboratories, Inc., Certified Biological Stains are supplied in 1, 10, 25 and 100 gram bottles. Aqueous and alcoholic solutions prepared on short notice, also mixed stains containing two or more dyes.

## MEDICINAL DYES

Acriflavine GH	Provoflavine
Brilliant Green	Pyoktanine Blue
Methyl Violet	Pyoktanine Yellow
Methylene Blue	Scarlet Red
Naga Red	Trypan Blue
Para-fuchsin	Trypan Red
Proflavine GH	Tryparosan

The use of therapeutic agents derived from dyestuffs as internal antiseptics has assumed such importance in recent years that Heyl Laboratories, Inc., made the necessary arrangements with the Chemical Foundation, Inc., the present owners of the original German patents covering the manufacture of 3:6-Diamino-acridine Salts, and the derivative, 3:6-Diamino-10-methylacridinium Chloride. We are therefore the only producers of Acriflavine GH and Proflavine GH in the United States. The two compounds are manufactured with our usual care and thoroughness, and are thoroughly tested both chemically and biologically before shipment.

## HEYL SPECIALTIES

Neutral Acriflavine (Neutroflavine)
Toluidine Blue (Schultz 5th ed. No. 592)
Pyronin G (Schultz 5th ed. No. 568)
Methyl Green (Schultz 5th ed. No. 519)
Cresyl Blue (Schultz 5th ed. No. 621)
Methylene Violet (Schultz 5th ed. No. 680)

## LITERATURE

Write for our descriptive catalog, mentioning the class of compounds you are interested in.



# EDWARD HILL'S SON & CO.

64 WALL STREET, NEW YORK, N. Y.

WESTERN OFFICE Tribune Bldg., CHICAGO, ILL.

Cable Address  
"HILL'S," New York

## PRODUCTS

Soda Ash  
Caustic Soda  
Sodium Bicarbonate  
Arsenic, White  
Antimony  
Antimony Oxide  
Antimony Sulphide  
Tin  
Citronella Oil

Ores of  
Antimony  
Bismuth  
Manganese  
Molybdenum  
Tin  
Tungsten

## SODA ASH ( $\text{Na}_2\text{CO}_3$ )

Light 58%, packed in bags of 300 lb. net and barrels of 276 lb. net.

Granular Dense 58%, packed in bags of 400 lb. net and in barrels of 425 lb. net.

Light 58% Soda Ash is used principally in the manufacture of Soap and Cleansers, Paper, Textiles, for water softening, and for the prevention of timber mold.

Granular Dense is made especially for glass-making, being practically free from dust, making its use most economical.

## CAUSTIC SODA ( $\text{NaOH}$ ) 60%, 70%, 74%,

76%-78%, Solid and Ground

• • • **Solid**—Packed in iron drums of 760 lb. net.

**Ground**—Packed in iron drums of 500 lb. net and 100 lb. net, and in hardwood casks of 550 lb. net.

Caustic Soda is used principally in the manufacture of Soap, Paper, Refining Oils, Lye, Chemicals, Drugs and Dyes.

We make special high-test Caustic Soda particularly adapted for Mercerizing Cotton Yarns and in the manufacture of artificial Silk, and for use in Primary Batteries.

Ground Caustic Soda is furnished in any size grinding, to meet special requirements.

Caustic Soda Bottoms, packed in iron drums of about 900 lb. net, for use in reclaiming rubber and in the manufacture of laundry soap.

## SODIUM BICARBONATE ( $\text{NaHCO}_3$ )

Packed in bags of 300 lbs. net.

bbls. of 400 " "

kegs of 112 " "

A high grade product, conforming to the requirements of the United States Pharmacopeia and guaranteed under the Pure Food & Drugs Act; manufactured in both Powdered and Granular form; used principally in the manufacture of baking powder, drugs, carbonating beverages, and for the prevention of timber mold.

Another grade, which we call Carbonic Soda, not always so highly refined, used by bottlers in carbonating waters, charging fire extinguishers, and in the tanning industry.

## SOLE SELLING RIGHTS

We are sole selling agents for the Michigan Alkali Co., Wyandotte, Michigan, for the sale of their WYANDOTTE BRAND SODA ASH, CAUSTIC SODA and BICARBONATE OF SODA.

Sole U. S. A. agents for Cookson & Co., Ltd., Newcastle-on-Tyne, England, for the following products:

Golden Sulphuret of Antimony  
White Oxide of Antimony  
Barytes  
Antimony Metal  
"C" Brand  
"Tyne" Brand  
R. M. M. Brand  
Timonox

Sole U. S. A. agents for China Mining & Metal Co., Hong Kong, China, for the sale of general line of Oriental Produce. We specialize in:

Chinese Antimony Metal	Cassia Oil
Chinese Antimony Crude	Anise Oil
Chinese Antimony Ore	Peanut Oil
Tungsten Ore	Soya Bean Oil
Manganese Ore	China Wood Oil
Tin Ore	Crude Camphor
Molybdenum Ore	Asbestos
Bismuth Ore	Mica
Chinese Tin No. 1, 99%	Vermilion

We also represent American and Canadian manufacturers on

Powdered White Arsenic.

# HOOKER ELECTROCHEMICAL COMPANY

Established 1901

25 PINE STREET, NEW YORK, N. Y.

Cable Address  
"HOOKELEC," New York  
All Codes

WORKS: ECHOTA, NIAGARA FALLS, N. Y.

## PRODUCTS

We manufacture

Acetyl Chloride

Aluminum Chloride, Technical Anhydrous

Antimony Pentachloride, Technical Anhydrous

Antimony Sulphuret, Crimson

Antimony Trichloride, Technical Anhydrous

Benzoyl Chloride

Bleaching Powder

Chlorine, Liquid

Chlorobenzol, Mono

Dichlorobenzol, Para-

Ferric Chloride, Crystals

Ferrous Chloride, Crystals

Hydrochloric Acid

C. P.

Hooker White

Commercial

Soda, Caustic—Solid, Ground and Powdered

Sodium Benzoate, U. S. P.

Solvent No. 74, A chlorinated benzol product

Sulphur Chloride

Sulphuryl Chloride

## TOWNSEND PROCESS

The Townsend Process is used for the Electrochemical production of Chlorine and its derivatives and Caustic Soda from ordinary salt. The valuable patents on this process, both Domestic and Foreign, which we use, are owned by us.

## LITERATURE

Bulletins describing the manufacture, uses and specifications of our products, including Bleaching Powder, Caustic Soda, Hydrochloric and Muriatic Acids, Liquid Chlorine, Paradichlorobenzol and Benzoate of Soda, will be sent on request.

## BLEACHING POWDER (Chloride of Lime)

Analysis: Available Chlorine.....35-37%

Other grades when required.

### CONTAINERS

Domestic.	Approx. Lb. Gross	Tare	Approx. Lb. Net
Steel Drums	800	42	750
Steel Drums	325	26	300
Steel Drums	100	12	90
Wooden Barrels	415	66	350

**Export:** From actual experience over a long period of years in export shipments Hooker drums have been developed of extra heavy steel and embody other special protective features.

	Approx. Lb. Gross	Tare	Approx. Cubic Feet
Steel Drums	453	53	12.1
Steel Drums	180	18	3.4
Steel Drums	58	8	1.8
Wooden Barrels	415	66	13.7

## CAUSTIC SODA

Analysis: New York and Liverpool Test

Sodium Oxide.....77.7 to 77.9%

Sodium Hydrate.....97.02 to 97.27%

Other grades when required.

### CONTAINERS

Domestic: New air tight steel drums of the following weights:			
	Lb. Gross	Tare	Lb. Net
Steel Drums	740	20	720
Steel Drums	220	9	220
Ground:			
	Approx. Lb. Gross	Tare	Approx. Lb. Net
Steel Drums—Domestic	27	27	400
Steel Drums	114	9	125
Wooden Barrels	596	66	500
Export:			
	Lb. Gross	Tare	Cubic Feet
Steel Drums	740	20	8.4
Steel Drums	220	9	6.6
Steel Drums	121	9	1.5

## HOOKER WHITE MURIATIC ACID SYNTHETIC AND HOOKER C. P. HYDROCHLORIC ACID

Grades:.....18°, 20°, and 22° Beaumé

### CONTAINERS

**Domestic:** Glass carboys, boxed and packed with straw, 12 gallons, approximately 118 pounds net, 80 pounds tare.

**Export:** Square boxed glass carboys, 12 gallons approximately, 208 pounds gross, 90 pounds tare, cu. ft. 7.3

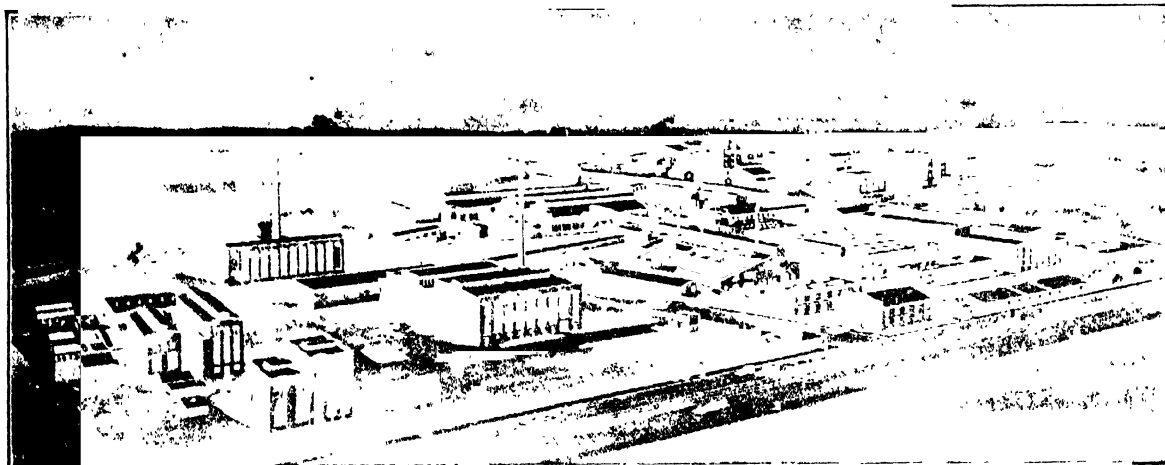
## LIQUID CHLORINE

Analysis: Chemically pure and anhydrous.

### CONTAINERS

Cylinders:			
Gross	Net	100 pounds	Net
200 pounds	100 pounds	Net	100 pounds
Size			
Outside Diameter	8 1/2 inches		
Total Height	53 inches		
Height to Valve Outlet	50 inches		

Steel cylinders complete with Valves and Protecting Caps



WORKS: ECHOTA, NIAGARA FALLS, N. Y.

# HUMMEL & ROBINSON CORPORATION

Manufacturers and Importers of Industrial Chemicals, Colors and Raw Materials



26 Cortlandt Street  
NEW YORK, N. Y.

AGENTS IN  
Chicago, Ill.  
Philadelphia, Pa.  
Cleveland, O.  
San Francisco, Calif.  
New Orleans, La.

Cable Address  
HUMMEL, New York  
FACTORY  
Brooklyn, N. Y.  
WAREHOUSES  
Hoboken, N. J.  
Brooklyn, N. Y.

Trade-Mark

## PRODUCTS

We are manufacturers and also represent leading European producers of approved standards of Chemicals, Dry Colors, and Specialties for the Rubber, Varnish, Paint, Leather, Textile, Glass, Pyrotechnic and Allied Industries.

## ACIDS

Butyric  
Formic  
Lactic, Edible and Technical  
Molybdic  
Oxalic  
Stearic  
Tannic  
Phosphoric

## DRIERS

Cobalt Acetate  
Cobalt Linoleate  
Cobalt Oxide  
Cobalt Sulphate  
Cobalt Nitrate  
Lead Resinate, Fused and Precipitated  
Lead Linoleate  
Manganese Borate  
Manganese Chloride  
Manganese Oxide  
Manganese Resinate, Fused and Precipitated  
Manganese Sulphate

## PYROTECHNICS

Antimony Sulphide, Needle  
Barium Chlorate  
Barium Nitrate  
Bronze Powder  
Iron Filings  
Potassium Chlorate  
Potassium Perchlorate  
Potassium Nitrate  
Phosphorus  
Sodium Oxalate  
Strontium Chlorate  
Strontium Nitrate  
Strontium Carbonate  
Strontium Oxalate  
Stearic Acid

## TANNING MATERIALS

Blood Albumen  
Birch-tar Oil  
Lactic Acid, 22%, 44%, 80%  
Antimony Lactate  
Red Arsenic  
Titanium-Potassium Oxalate  
Woolgrease, Neutral  
Degras

## MISCELLANEOUS CHEMICALS

Ammonium Bifluoride  
Ammonium Molybdate  
Ammonium Oxalate  
Amyl Butyrate  
Antimony Sulphide, Needle  
Antimony Sulphuret, Crimson and Golden  
Cadmium Sulphide  
Calcium Lactate  
Calcium Bilactate  
Cerium Oxalate  
Fluorspar  
Fusel Oil, Crude and Refined  
Lanoline crude  
Lanoline, U. S. P., Hydrous and Anhydrous  
Lithopone  
Magnesium Carbonate  
Magnesium Chloride  
Potassium Oxalate  
Potassium Binoxalate  
Rutile  
Uranium Oxide  
Zinc Chloride  
Zinc Oxide

## DRY COLORS AND PIGMENTS

Blacks  
Carbon Black  
Bone Black  
Drop Black  
Ivory Black  
Lampblack  
Vine Black  
Mineral Black  
Graphite Black  
Reds  
Iron Oxide, Natural  
Iron Oxide, Artificial  
Venetian Red  
Red Ocher  
Indian Red  
Spanish Oxide  
Yellows  
French Ocher  
Yellow Oxide  
Sienna, Raw  
Sienna, Burnt  
Browns  
Turkey Umber, Raw  
Turkey Umber, Burnt  
Sap Brown  
Van Dyke Brown  
Whites  
Barytes  
Lithopone  
Zinc Oxide

# INDUSTRIAL CHEMICAL COMPANY, INC.

HEAD OFFICE

Fifth Avenue Building, 200 Fifth Avenue

NEW YORK, N. Y.

Cable Address  
"KEMICO" New York

LABORATORIES 36 West 17th Street



## PRODUCTS

**Acetone, Refined. C.P.**  
**Acetone Oils. B.P. 80 -200 C.**  
**Methyl-ethyl-ketone**  
**Mixed Ketones**  
**Denatured Alcohol. All formulas**  
**Methyl Alcohol. All grades**  
**Cymene. Terpene base oil**  
**Tanning Extracts**  
     Hemlock Bark  
     Larch Bark  
     Chestnut Wood  
     Osage Orange  
**Dyewood Extract. American Fustic**  
**Carbons**  
     Decolorizing and Deodorizing  
**Powdered Charcoal**  
**Whiting**  
**Chalks**  
     Extra Light  
     Light  
     Heavy  
**Gas Carbon Black**  
**Vegetable Carbon Black**  
**Wood Flour**

## ACETONE OILS

Oils of great solvent power furnished with any desired range of boiling point from 80°C -200°C

## CYMENE

A terpene base oil of great solvent power and strong, pleasant odor. Double-distilled product, Boiling-point 175°C

## OSAGE ORANGE

An extract possessing both dyeing and tanning properties, produced in the form of powder or paste. Has largely superseded West India Fustic for dyeing cotton, wool and silk, and particularly valuable in leather tannage on account of its light color and high tanning content.

## CHALKS

Domestic Products of a high degree of purity and a bulkiness second to none. We claim to be in a position to supply a lighter chalk than any other on the market. We manufacture three grades: Extra Light, Light and Heavy.

## SUPER-FILTCHAR

### Decolorizing and Deodorizing Carbon.

Experience has so fully justified all our previous claims for this product that we can now affirm that it has become a standard article in a variety of plants and processes.

We have found that the needs of a great majority of our customers have been covered by one of our three grades, and are therefore offering, as before, three qualities of **Super-Filtchar**; **Edible Oil**, **Pharmaceutical** and **Sugar**.

### Edible Oil Quality

Our success in this field has been inspiring.  
*Nut Oils Cocoa nut and Palm Kernel.*

Better results are obtained with small fractional percentages of Super-Filtchar than with 5% of fuller's earth

*Seed and Bean Oils Cottonseed, Soya, Peanut.*

Super-Filtchar is the ideal complement to fuller's earth. Results in

1. Better color
2. Removes earthy and objectionable flavors.
3. Reduced amount of fuller's earth giving:
  - a—Lower absorption losses.
  - b—Increased run of presses.
  - c—Decreased labor cost.

*Lard, Tallow and kindred products*

Excellent results are being obtained with very small amounts of carbon.

### Pharmaceutical Quality

Made especially for those industries held strictly accountable by law to produce an absolutely pure product. Used extensively in the manufacture of Glycerine, Tartaric Acid, Lactic Acid, Phosphoric Acid, Gelatine, Fruit Juices, Photographic and other high-grade chemicals where purity of product is paramount.

### Sugar Quality

While the Pharmaceutical Quality has considerable value for decolorizing, clarifying and improving the flavor of various syrups, we can unreservedly recommend our Sugar Quality for the improvement of all saccharine liquors.

### Cooperative Service

Our wide experience in decolorizing and deodorizing different products has taught us that the treatment of each substance should be considered as an individual problem. Our Technical Department will gladly advise as to the quality, quantity and method best suited for any particular purpose and is ready, at all times, to cooperate with prospective customers in whatsoever way they choose.

# INTERNATIONAL COAL PRODUCTS CORPORATION

PLANTS  
SOUTH CLINCHFIELD, VA  
IRVINGTON, N. J.

511 Fifth Avenue, NEW YORK, N. Y.

Cable Address  
"CARBOCOAL," New York.



Trade-Mark

## PRODUCTS

Ammonia Liquor  
Crude Carbolic Acid  
Coal Tar Oils  
Coal Tar Pitch  
Creosotes  
Disinfectant Oils  
Flotation Oils  
"Incolac"  
"Incolene"  
"Incolite"  
"Incopitch"  
"Incosate"  
Naphthalene  
Tars  
Wood Preservatives

**AMMONIA LIQUOR (Gas Liquor)**  
Free from tar Minimum cyanogen content.

**ANTHRACENE OIL**  
Specific gravity 1.0988 to 1.100

**CRUDE CARBOLIC ACID**  
Acid content from 5 to 40%

**CREOSOTES**  
All grades, Standard specifications, Coal Tar Solutions, etc

**CREOSOTE, SOLUBLE**  
An emulsified creosote

**DEAD OIL (Heavy Oil)**  
Clear and limpid. For shingle stains, lampblack, etc

**DIP OILS**  
For animal washes, sheep dips, etc

**DISINFECTANT OIL**  
Phenol coefficient 2 to 6

**FLOTATION OILS**  
Acid content 6 to 30%, also low temperature tar very suitable for flotation.

**"INCOLAC"**  
A black, waterproof, acid-resisting, rust-proof paint, for wooden structures, fence posts, smokestacks, and all metal surfaces.

**"INCOLENE"**  
High-grade motor fuel. Product of low temperature distillation containing both paraffin and aromatic hydrocarbons, but no admixture of gasoline

**"INCOLITE"**  
A thinner for "Incolac" and other coal-tar paints

**"INCOPITCH"**  
A high-grade roofing pitch. Furnished with any melting point

**"INCOSOTE"**  
A tar-oil distillate. Specific gravity 0.98. Tar acid content 30%.

## LIGHT OIL

Boiling point 110° to 180° C. Including special low gravity oils. Special cuts on request

## MIDDLE OIL

A thin creosote. Specific gravity 0.9675 to 1.010

## NAPHTHALENE (Crude)

Melting point approximates 70° C

## NEUTRAL OIL

A reddish brown, clear, limpid oil. Suitable for making up disinfectants

## PITCH

For roofing, briquetting, and waterproofing

## ROAD OILS

For road construction, surface oiling, and dust-laying

## SANITARY OIL

A creosote oil for workers, factory lavatories, etc

## TARS

Coke oven, dehydrated, refined. Solutions. Special low gravity tars

## TAR ACID OIL

## HEAVY NAPHTHA

160°-210° For paints and degreasing purposes

## SHIPMENTS

We have our own tank cars (8000 and 10000 gal.) and also ship in iron drums

## CARBOCOAL

A smokeless fuel, manufactured from bituminous coal. Equal to best grades of prepared anthracite. Carbocoal is dense, dustless, clean, uniform in size and quality, and can be readily handled and transported long distances without disintegration. It is grayish in color, slightly resembling coke, but its density more nearly approaches that of anthracite coal. It is manufactured in briquet form.

Heretofore, devolatilized fuels, such as coke, have not attained the high rates of combustion desired for locomotive, marine and general steam purposes, and their greater displacement has operated against their general use where transportation cost or stowage space has been an important factor. Carbocoal is a relatively soft but tough form of carbon readily attacked by oxygen in combustion; and for this reason, requires much less draft than other high-carbon fuel.

## CARBOCOAL PLANTS

Engineers, Constructors, and Operators  
Estimates and financial plans on application.

# THE INTERNATIONAL NICKEL COMPANY

Nickel, Monel Metal, Nickel Salts

GENERAL OFFICES

MUNSON BLDG., 67 WALL ST., NEW YORK, N. Y.

MINES AND SMELTERS

Sudbury, Ont., Canada

REFINERIES

Bayonne, New Jersey and Port Colborne, Ont., Canada



## PRODUCTS

### Nickel Salts

Nickel Acetate	Nickelic Hydroxide
Nickel-Ammonium Sulphate	Nickelous Hydroxide
Nickel Carbonate (Basic)	Nickel Oxide (Black)
Nickel Chloride	Nickel Oxide (Green)
Nickel Chromate (Basic)	Nickel (Reduced Oxide)
Nickel Formate	Nickel Sulphate
	Nickel Sulphide (Fused)
	Nickel Sulphide (Pptd.)

### Nickel

Shot	Flats
Blocks	Strip
Ingots	Sheet
Electrolytic nickel—99.80%	Wire
Rods	Tube
Castings	Wire cloth

### Monel Metal

Shot	Flats
Ingots	Rods
Blocks	Strip
Sheet	Castings
Tube	Wire
	Wire cloth

## NICKEL

Long before the isolation and recognition of the element nickel, alloys of a copper-nickel composition were known and used. Representative of such alloys are Bactrian coins of the Third Century B. C.

In 1094 Hierne discovered the mineral known as Niccolite, but not until 1751, however, was the metal isolated by Cronstadt, who recognized it as a new element and metal, and in 1754 named it "Nickel."

Since that time the chemistry of this metal has been continuously unfolded until today a large variety of its alloys and compounds are known.

**Malleable Nickel**—In 1804, Richter showed that the metal was malleable, ductile and possessed a high tensile strength. Fleitman, in 1879, made an even more malleable nickel by the addition of magnesium.

**Electroplating**—was produced in 1843 by Boettger.

**Nickel Steel**—In the New York Exposition in 1853, nickel iron alloys were exhibited. After this, Marbeau, in France, made experiments with crucible steel alloys, and in 1888 James Riley began experimenting with nickel steel in Scotland. The results were published in 1889. These demonstrated the properties of nickel steels and pointed out their commercial value. This group today is the most widely used of all alloy steels.

**Hydrogenation of Oils**—In 1896 Sabatier and Senderens showed that nickel has the remarkable property of causing, by its catalytic action, the reduction of unsaturated hydrocarbons and other organic com-

pounds to saturated ones by means of molecular hydrogen. There was thus initiated the process of producing edible, saturated oils and fats from cheaper unsaturated ones.

**The Edison Accumulator**—Thomas A. Edison, in 1902, developed and patented the "nickel" storage cell largely used in place of the lead accumulator in electric motors and vehicles.

**Monel Metal**—In 1905 The International Nickel Company first produced this natural alloy by the direct reduction of their ores, without effecting any separation of the copper nickel contents.

This metal possesses physical and chemical properties very similar to those of metallic nickel, which have led to its extended use by the modern manufacturer, especially where strength combined with chemical corrosion or steam erosion resistance is a requisite.

## GENERAL CHARACTERISTICS OF NICKEL

Nickel is a white, malleable, and somewhat magnetic metal, harder and stronger than iron and of high melting point. It is remarkably resistant to the action of air and water, of non-oxidizing acids, fused alkalis and of salts, either fused or in aqueous solution.

**Valency**—As well known, Nickel is primarily divalent, it forms some compounds relatively unstable, in which it functions as tri-valent; and there exists also a peroxide ( $\text{NiO}_2$ ).

Nickel belongs to that odd group of metals—nickel, cobalt and iron, which in the Periodic System of the elements hovers uncertainly between the acid-forming and the base-forming elements, and which is related quite closely to the noble platinum metals.

**Catalytic Activity**—Nickel and its compounds possess a unique catalytic activity both in variety and intensity; they may function apparently in reduction, oxidation and addition reactions. Thus finely divided nickel is used in the **hydrogenation of oils**, nickel oxide will catalyze the oxidation of gaseous sulphur dioxide in the **contact process**, nickel chloride, similarly, the production of chlorine in the **Deacon process**. Nickel chloride will also perform the function of catalyzer in the famous **Friedel and Craft** syntheses.

**Passivity**—Nickel exhibits markedly the phenomenon of passivity, i. e., of becoming inert to the action of highly oxidizing acids, such as nitric or chromic, when exposed to their action. We may ascribe to this interesting property some measure, at least, of its ability to withstand corrosion.

**Color**—Nickel is a powerful decolorizing agent for metals such as copper and gold. Several jewelers' white alloys are produced today as substitutes for platinum under the name of white gold. They contain from 20 to 50% of nickel with the remainder gold. Even in small amounts nickel decolorizes copper and its alpha alloys.

The chemical compounds of nickel exhibit its greatest variety of color, varying from the green of its com-

*Continued on Next Page*

mon salts to the red of the dimethylglyoximate. Recent developments indicate that nickel salts associated with oxides of zinc, barium, calcium or potassium in the preparation of ceramic glazes, are capable of producing a wide range of colors.

Perhaps one of the oldest commercial uses of nickel salts is as a mordant in the dyeing industry.

### MONEL METAL

The name Monel metal identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by the International Nickel Company. Monel metal withstands alkalis, hot gases, most acids, saline solutions, and extremes of temperature. It is very resistant to corrosion and abrasion.

It is tough, ductile and has the strength of mild steel.

It can be machined, cast, forged, rolled, drawn, brazed, soldered, welded, annealed and spun.

TABLE OF PHYSICAL PROPERTIES OF MONEL METAL

Melting Point . . .	1 360°C (2 480°F)
Specific Gravity (Cast)	8.87
Weight Per Cu. In. (Cast)	0.319 lb.
Weight Per Cu. In. (Rolled)	0.321 lb.
Coefficient of expansion (20°C - 100°C)	0.0000765 per 1°F
Electrical Resistivity, 256 Ohms per mil foot (Temp. Coefficient) . . .	0.0011 per 1°F
Electrical Conductivity . . .	4% (Copper 100%)
Heat Conductivity . . .	1.15 that of Copper
Shrinkage . . . . .	1.4% per foot
Hardness Cast Material . . . . .	20-30 (Shore Scleroscope)
Hardness Hot Rolled Rods . . . . .	27 (Average Shore Scleroscope)
Hardness, Hot Rolled Rods . . . . .	162 (Average Brinell)
Modulus of Elasticity . . . . .	22 000 000-25 000 000
Torsional Tests on Rods (Average)	
Shearing Stress—Lbs. per sq. in. on remoted fibers	
At Elastic Limit . . . . .	31 796
At Ultimate Load . . . . .	79 053
Compression Tests on Rods	
Proportional Limit . . . . .	28 000 to 50 000 lbs. per sq. in.
Yield Point . . . . .	61 000 to 70 000 lbs. per sq. in.
Compression Tests on Castings	
Proportional Limit . . . . .	15 000 to 30 000 lbs. per sq. in.
Yield Point . . . . .	30 000 to 32 000 lbs. per sq. in.
Compression Tests on Castings (Average)	
Yield Point . . . . .	37 093 lbs. per sq. in.
Tensile Strength . . . . .	72 283 lbs. per sq. in.
Elongation in 2 ins. . . . .	14%
Reduction of Area . . . . .	32%
Tensile Tests on Rods	
Yield Point . . . . .	55 000 lbs. per sq. in.
Tensile Strength . . . . .	88 100 lbs. per sq. in.
Elongation in 2 ins. . . . .	14.2%

TABLE OF THEORETICAL WEIGHTS MONEL METAL SHEETS

U. S. Legal Standard	THICKNESS		WEIGHT		U. S. Legal Standard	THICKNESS		WEIGHT	
	Approximate Thickness in Fractions of an Inch	Approximate Thickness in Decimal Parts of an Inch	Weight per Square Foot in Ounces	Weight per Square Foot in Pounds		Approximate Thickness in Fractions of an Inch	Approximate Thickness in Decimal Parts of an Inch	Weight per Square Foot in Ounces	Weight per Square Foot in Pounds
3	17-64	265625	194 1/4	12.211	16	1-16	0625	45 1/2	2.871
4	1-4	25	183	11.493	17	9-160	5625	41	2.586
5	15-64	234375	171 1/4	10.774	18	1-20	05	36 1/2	2.30
6	7-32	21875	160 1/4	10.056	19	7-160	04375	32	2.011
7	13-64	203125	148 1/4	9.338	20	3-80	0375	27 1/2	1.724
8	3-16	1875	137 1/2	8.619	21	11-320	034375	25	1.580
9	11-64	171875	126	7.901	22	1-32	03125	22 1/2	1.437
10	5-32	15625	114 1/2	7.183	23	9-320	028125	20 1/2	1.293
11	9-64	140625	103	6.465	24	1-40	025	18 1/2	1.149
12	1-8	125	91 1/2	5.746	25	7-320	021875	16	1.005
13	7-64	109375	80 1/2	5.028	26	3-160	01875	13 1/2	.862
14	3-32	99375	68 1/2	4.310	27	11-640	0171875	12 1/2	.7901
15	5-64	078125	57 1/2	3.591	28	1-64	015625	11 1/2	.7183
	9-128	0703125	51 1/2	3.232					

### MONEL'S PROBABLE RESISTANCE TO CORROSION

On account of the varying conditions occurring in chemical work, it is difficult to recommend Monel unqualifiedly in connection with any particular substance. The following list is intended to show where Monel can be recommended and where Monel is not recommended.

Y— Monel is recommended	Palmitic Acid	Y
N— Monel is not recommended	Perchloric Acid	N
T— Reports contradictory; trial should be made	Phosphoric Acid (cold weak)	Y
	Phosphoric Acid (hot)	N
Aluminum Sulphate	Picric Acid (cold)	Y
Ammonia	Picric Acid (hot)	N
Boracic Acid	Potassium Hydroxide	Y
Butyric Acid	Sodium Hydroxide	Y
Calcium Chloride	Sodium Hyposulphite	Y
Calcium Sulphate	Sodium Sulphate	Y
Carbolic Acid	Stearic Acid	Y
Chromic Acid	Sulphuric Acid	Y T
Citric Acid	Sulphurous Acid	N
Copper Sulphate	Tannic Acid	Y
Ferric Sulphate	Tartaric Acid	Y
Formic Acid	Water Fresh	Y
Hydrochloric Acid	Water Salt	Y T
Hydrocyanic Acid	Zinc Salts	N T
Hydrofluoric Acid	Atmospheric corrosion	N
Lactic Acid	Molten Metals	N
Lime	Gases of combustion	Y T
Malic Acid	Molten sulphur	N
Mercuric Chloride	Metallic Mercury	Y
Moronic Acid	Steam superheated	Y
Nitric Acid	Steam wet	Y
Oleic Acid		Y

### SOME USES FOR WHICH MONEL METAL HAS PROVED TO POSSESS PECULIAR MERITS

Filter cloth, screens, centrifugal liners, pump and valve parts, agitators and shafts, tie rods, nuts, washers and lag screws in chemical plants, tanneries, dye-houses, bleacheries, etc. Trays for shelf dryers, crystallizing pans, tubing for evaporators, concentrators and stills, linings for chemical equipment.

Mine screens, coal chutes, mining machinery and equipment, pump liners and rods, parts of centrifugal pumps, valves and fittings in the coal industry.

Pump parts, fourdrinier screen, cylinder covers, rolls, valves and castings in pulp and paper mills.

Ink handling machines—bottle fillers, etc.

Refrigerating machine parts, valves and trim and pump parts for handling brine, etc.

Parts of special glass factory equipment coming in contact with hot glass.

Homogenizers, tanks, freezer parts, evaporators, for all dairy products except cheese.

It is used in power plants in all industries for turbine blading, valve parts and all places which come in contact with superheated steam.

Cooking equipment in hotels, factory restaurants, etc., and also in packing houses and plants manufacturing food products where materials come in contact with food acids, fruit juices, brine, etc.

### TECHNICAL RESEARCH

The International Nickel Company maintains a large technical staff and laboratory for the purpose of testing its products under various conditions, and will be glad to investigate and give advice to anyone who wishes to submit any question on Monel metal or nickel.

### LITERATURE

Instruction sheets on the various methods of working Monel can be had on application.

# JARDINE, MATHESON & CO., LTD.

Importers and Exporters

25 Madison Avenue

NEW YORK, N. Y.

OFFICES IN CHINA AND JAPAN

Hong Kong  
Amoy  
Chungking  
Nanking

Shanghai  
Canton  
Foochow  
Newchwang

Hankow  
Changsha  
Harbin  
Swatow

Tientsin  
Chengtu  
Ichang  
Wuhu

Tsingtao  
Chinkiang  
Kiukiang

Yokohama

Kobe

Nagasaki

Shimonoseki

## PRODUCTS

### Importers of

#### Albumen

Dried Egg

#### Beans, Peas and Seeds

#### Braids

Straw and Hemp

#### Bristles

#### Camphor

#### Cotton, Raw

#### Deerskins, Untanned

#### Eggs and Egg Products

#### Feathers

Duck

Goose

Fowl

#### Fibers

China Grass (Ramie)

Hemp

Jute

#### Fur Skins

Raw

Dressed

#### Gallnuts

#### Goatskins and Sheepskins, Untanned

#### Hair

Goat

Horse

Human

#### Hides and Skins, Untanned

#### Minerals

Antimony

Tungsten Ore

#### Musk

#### Oils, Essential

Anise

Cassia

### Oils, Textile

Tea-seed

### Oils, Vegetable

Castor

China Wood

Cotton-seed

Peanut

Rape-seed

Sesame

Soya-bean

### Peanuts

### Silk, Raw

### Spices, Cassia

### Tea

### Tallow

Animal

Vegetable

### Tobacco

### Wool, Raw

Camel

Cashmere

Lamb

Sheep

### Yolk, Egg

Dry

### Exporters of

Railway Equipment

Electrical Supplies

Iron and Steel Products

Metals

Marine Motors

Machinery

General Merchandise

Cotton, American Raw



# WILLIAM E. JORDAN, INC.

Manufacturers, Importers and Distributors of Coal-Tar Products

Code  
ABC, 5th Edition

7-11 CLIFF STREET, NEW YORK, N. Y.

Cable Address  
"DANJORD", New York

REPRESENTING

JORDAN COAL TAR PRODUCTS CO., INC.  
WORKS: Matawan, N. J. and Brooklyn, N. Y.

INTERNATIONAL COAL PRODUCTS CORPORATION  
WORKS: Churchfield, Va. & Livingston, N. J.

PRODUCTS	Specifications and General Information	Packages usually sold in, with approximate weight and cubic measure			
		Container	Contents	Gross lb	Net lb Cu. ft.
<b>Cresol, Meta-, 98-100%</b>					
<b>Cresol, Ortho</b>					
<b>Dip Oils</b>					
<b>Crude Carbolic Acid</b>					
<b>Creosote Oils</b>					
<b>Flotation Oils</b>					
<b>Naphthalene, Refined</b>					
<b>Pyridine</b>					
<b>Sheep Dip</b>					
<b>Shingle Oils</b>					
<b>Solvent Naphtha</b>					
<b>Toluol</b>					
<b>Benzol</b>					
<b>Soluble Creosote</b>					
<b>Black Paints</b>					
<b>Pitch</b>					
<b>Benzol, Pure</b>	Water white, distilling between 79° and 81° C	Drums	100 gal	950	720 24
<b>Benzol, 90%</b>	Water white, distilling 90% at 100° C	Drums	100 gal	950	720 24
<b>Toluol, Pure</b>	Water white, distilling between 109° and 111° C	Drums	100 gal	950	720 24
<b>Toluol, 90%</b>	Water white, distilling at least 90% at 120° C	Drums	100 gal	950	720 24
<b>Xylol, Pure</b>	Water white, distilling between 135° and 145° C	Drums	100 gal	950	720 24
<b>Xylol, Commercial</b>	Water white, distilling 90% at 150° C	Drums	100 gal	950	720 24
<b>Solvent Naphtha, 90%</b>	Water white, distilling 90% at 160° C	Drums	100 gal	950	720 24
<b>Solvent Naphtha, Crude</b>	Straw color, distilling 80% at 160° C	Drums	100 gal	925	700 24
<b>Heavy Naphtha</b>	Amber color, distilling 70% at 200° C	Drums	100 gal	1050	825 24
<b>Dead Oil</b>	Specific gravity, 0.980 to 1.000	Barrels		475	400 12
<b>Dip Oil</b>	Specific gravity, 1.000 to 1.030	Drums	100 gal	1050	825 24
<b>Creosote Oil</b>		Barrels		475	400 12
<b>Flotation Oils</b>	Specially prepared for Ore Flotation	Drums or	100 gal	1050	825 24
<b>Shingle Oil</b>	Specific gravity, 0.930 to 0.990	Link cars	about 8000 gal		
<b>Crude Carbolic Acid</b>	Spec. grav. according to Tar Acid content	Drums	100 gal	1050	825 24
<b>Creosote Soluble</b>	Sold under various private names or brands	Drums	100 gal	1050	825 24
<b>Sanitary Fluid or Sheep Dip</b>	Sold under various private names or brands	Drums	100 gal	1050	825 24
<b>Carbolic Acid Crystal, U. S. P.</b>	White crystal, melting-point 39° to 41° C	Drums	240 lb	251	240 12
<b>Phenol, U. S. P.</b>	White crystal, melting-point 39° to 41° C	Drums	175 lb	580	475 12
<b>Pyridine</b>	90% at 160° C for denaturing	Drums	240 lb	300	240 12
<b>Anthracene</b>	20% - 40% - 80%	Drums	100 gal	1050	816 24
<b>Naphthalene, Crude and Refined</b>	Crude in bags Refined in barrels	Drums	100 gal	1050	816 24
<b>High Boiling Acids</b>	British War Office Spec	Drums	100 gal	1075	850 24
<b>High Coefficiency Fluid</b>	18 to 20 coefficient, Rideal-Walker Method	Barrels	50 gal	506	425 12
<b>Crealylic Acid, 95 to 100%</b>	Pale color at time shipment, also dark color	Drums	100 gal	1050	850 24
<b>Cresol, U. S. P.</b>	Distilling 90% between 195° and 205° C	Barrels	50 gal	500	425 12
<b>Cresol, Ortho</b>	Crystals, melting-point 28° to 29° C	Drums	100 gal	1050	850 24
<b>Cresol, Meta-, 98 to 100%</b>	Cans about 52 lb net	Drums	50 gal	385	336 11
<b>Cresol, Para-, 31° to 33° C</b>	Drums about 336 lb net or cans 112 lb	Drums	100 gal	385	336 11
<b>Jordanite, Black Paint, for iron or woodwork</b>	Drums 50 or 100 gal, or barrels 50 gal	Barrels	about 50 gal	550	475 11
<b>Tar, Refined, etc.</b>	Barrels 50 gal, or drums 100 gal	Drums	100 gal	1125	900 24
<b>Pitch, Roofing, etc.</b>	Barrels about 500 lb	Barrels	300 or 550 lb	525	450 11
<b>Black Steel Coating</b>	Barrels about 50 gal or drums 100 gal	Drums	100 gal	1125	900 24
<b>Black Varnish</b>	Barrels about 50 gal, or drums about 100 gal	Drums	50 gal	525	450 11
<b>Disinfecting Powder</b>	Barrels about 350 lb	Drums	100 gal	1125	900 24
<b>Absorbent base and Cresylic Acid for general disinfecting</b>		Barrels		375	350 11

# THE KALBFLEISCH CORPORATION

Manufacturers of Acids and Chemicals

Thirty-one Union Square West

NEW YORK, N. Y.

Cable Address  
KALF EDAL, New York  
Code  
Western Union, Universal Edition

Brooklyn, N. Y.

Waterbury, Conn.

WORKS  
Elizabethport, N. J.

Erie, Pa.

Chattanooga, Tenn.

## PRODUCTS

### Acids, Chemicals and Salts.

## ACIDS

**Dipping**—A mixture of sulphuric and nitric acids with a small quantity of muriatic, for brass and metal dipping or finishing. Made to special formula if desired. In carboys containing approximately 150 lb. net.

**Etching**—Nitric acid of a strength usually specified by user. In carboys containing 140 lb. net.

**Hydrochloric (Muriatic)**—Used by sugar mills, galvanizers, chemical manufacturers, bleachers, silk dyers, chlorine makers. Furnished in 18°, 20°, 22° Bé, commercial and C. P. grades. In carboys containing 120 lb. net.

**Nitric**—Used for chemical manufacturing, brass and metal finishing, dyeing, etching copper plates and printers' rolls. Furnished in 36° to 43° Bé, incl., and C. P. grades. In carboys containing 140 lb. net.

**Sulphuric**—Used for pickling iron and steel, in dye works, various chemical manufacturing processes, bleaching textiles, tanning. Furnished in 50°, 60° and 66° Bé, also C. P. grades. In carboys containing 180 lb. net, also 55 and 110 gal. drums containing 750 and 1500 lb. net, respectively.

**Electrolyte**—For lead storage batteries. Made from pure sulphuric acid, any strength 1.150 to 1.820 specific gravity. In carboys containing from 115 to 185 lb. net.

**Oil of Vitriol**—66° Bé Sulphuric acid.

**Aqua Fortis** (Nitric).

**Mixed** (Nitro-sulphuric).

**Muriatic** (Hydrochloric).

**Soldering** (Hydrochloric).

## SULPHATE OF ALUMINA

**Filter Alum**—For clarifying and purifying water for chemical and paper manufacturers, and refrigeration plants. Furnished in ground or lump form in two strengths 17% (ordinary) and 22% (extra concentrated). In barrels containing 400 lb. net or bags containing 200 lb. net.

**Paper Makers Alum**—Commercial sulphate of alumina, about  $\frac{1}{2}$  of 1% basic. For sizing and finishing cardboard, manila and wrapping papers, also book and music paper, and tanning leather. Furnished either lump or ground. In barrels containing 400 lb. net or bags containing 200 lb. net.

**Sulphate, pure**—Technically free from iron, actually contains only a mere trace of iron. Used in the

manufacture of lake colors for printing inks, for tinted bond papers and sizing high grade bond and ledger papers, and for tanning white and kid leathers. Either lump or ground. In barrels containing 400 lb. net or bags containing 200 lb. net.

## SALTS

**Artificial Salts**—Crystals or Powdered. For medicinal purposes. In barrels containing 375 lb. net.

**Glauber's Salt**—Crystallized sulphate of soda. Contains about 50% water of crystallization, but is preferred by many to the anhydrous salt on account of its easy solubility in water of ordinary temperature. Free from iron and absolutely neutral. For the textile and dyeing industries. In barrels containing 330 lb. net, also in kegs if desired.

**Salt Cake**—Sulphate of soda commercial, calcined, crude or ground. Used in the manufacture of glass, also in producing sulphate pulp for kraft paper. Standard 96% with about 1% free acid and about 1% salt. In barrels containing 400 lb. net.

**Sodium Sulphate, Extra**—A very pure sulphate called, in some cases, Calcined Glauber's Salt. Free from ammonia and iron, and strictly neutral. Used for standardizing aniline colors, etc. Contains no water of crystallization. In barrels containing 400 lb. net.

**Sodium Bisulphate** (Niter-cake)

**Sodium Bisulphite** (For bleaching)

**Calcined Sodium Sulphate**

**Cathartic Salts**

## MISCELLANEOUS

**Aqua Ammonia**—All strengths up to 26° Bé.

**Banana Liquid**

**Bronzing Liquid**

**Casein**

**China Clay** (English)

**Chloride of Zinc**

**Chromitron**—For polishing and sharpening razor blades, etc. An extremely fine, fast cutting material. Much superior to rouge, emery and like articles. In special package.

**Crystal Boro Phosphate**—Solvent for casein.

**Distilled Water**

**Lacquers and Thinners**

**Nitrate of Mercury**—For cutting fur.

**Perchloride of Iron**—For etching.

**Rosin Size**

**Satin White**

**Shellac Solvent**

**Soldering Fluid**

# A. KLIPSTEIN & COMPANY

ESTABLISHED 1872

Importers, Exporters, Merchants

614-652 Greenwich Street

NEW YORK, N. Y.

Cable Address  
"KLIPSTEIN", New YorkCodes  
Fischer's  
ABC 4th & 5th Editions  
Bentley's

## BRANCHES

Boston, Mass.  
283 285 Congress StreetCharlotte, N. C.  
Commercial National Bank BldgChicago, Ill.  
115 117 W. Kinzie StreetPhiladelphia, Pa.  
50 52 N. Front StreetProvidence, R. I.  
110 Fountain Street

Represented in Canada by

A. KLIPSTEIN &amp; COMPANY, LIMITED

12 St. Peter Street, MONTREAL

## PRODUCTS

Chemicals, Dyestuffs, Dyewood Extracts, Tanning Extracts, Coal-tar Dyes, Colors, Textile Chemicals, Pharmaceutical Chemicals, Gums, Oils and Raw Materials for all Industries.

This company is headquarters for all kinds of Chemicals, Colors, Dyestuffs, Glycerines, Gums, Oils, Tanning Materials, Raw Materials, and other products used in the various industries, and solicits your inquiries for prices whenever you are in the market either for prompt delivery from here or shipment from abroad. All inquiries will have prompt and careful attention.

## ACIDS

Acetic	Oxalic
Benzoic	Sulphuric
Carbolic (Crystals)	Stearic
Citric	Tannic
Formic	Tartaric
Lactic	Chromic
	Muriatic (Hydrochloric)

## OILS

Aniline	Birch
Creosote	Castor
China Wood	Fusel
Soya Bean	Turkey Red
Olive	Sulphonated
Myrbane	Corn

## SODAS

Bichromate	Arseniate
Carbonate	Benzoate
Caustic	Bisulphide
Chlorate	Cyanide
Nitrate	Permanganate
Nitrite	Peroxide
Sulphate	Prussiates
Sulphite	Red
Acetate	Yellow
Phosphate	Stannate

## TANNING MATERIALS

Ricinola Oil	Quebracho Extract
Pescola	Chestnut Extracts
Mazola Oil	Logwood Extracts
Soluble Castor Oil	Liberty Extract
Chrome Sulphate	Hemlock Extract
Liquor	Myrobalans
Mangrove Bark	Lactic Acid
Divi Divi	Medol

## POTASHES

Bicarbonate	Nitrate (Saltpeter)
Bichromate	Permanganate
Bisulphite	Prussiates
Chlorate	Red
Chloride	Yellow
Cyanide	Sulphate
Muriate	Sulphide

## DYES

Acid Dyes (for Wool and Silk)  
Basic Dyes (for Lakes, Leather and Paper)  
Chrome Dyes (for Wool)  
Direct Dyes (for Cotton)  
Pyrogen Dyes (for Cotton)  
Sulphur Dyes (for Cotton)  
Oil, Spirit or Water Soluble Colors (for Paints, Varnishes, etc.)

## GUMS

Congo	Tragacanth
Damar	Copal
Kauri	Karaya
Zanzibar	Synthetic
Arabic	Alcho-ester
Manila	Glycro-ester
Pontinac	Zinco-ester

## MISCELLANEOUS

Chrome Acetate	Bleach
Chrome Chloride	Solvent Naphtha
Chrome Sulphate	Naphthalene
Carbon Tetrachloride	Blue Vitriol
Chlorobenzol	Copper Sulphate
Benzol	Barium Sulphide
Barium Acetate	Barium Hydrate
Barium Carbonate	Barium Nitrate
Barium Chloride	Barium Peroxide
Barium Chlorate	Barium Sulphate
	Sulphate of Alumina
	Resinates (fused and precipitated)
	Oleates (fused and precipitated)
	Linoleates (fused and precipitated)

This company is also Sole Distributor for the products made by the

**Bulls Ferry Chemical Company**  
Edgewater, N. J.

**E. C. Klipstein & Sons Company**  
Chrome, N. J., and South Charleston, W. Va.



# LA MOTTE CHEMICAL PRODUCTS CO.

13 WEST SARATOGA STREET, BALTIMORE, MD.

Cable Address  
"LA MOTTE", Baltimore

## PRODUCTS

**Crystallized Indicator Dyes**  
**Standardized Indicator Solutions**  
**Standardized Synthetic Chemicals**  
**Analytical Outfits**  
**Standard Buffer Solutions**  
**Color Standards**  
**Special Reagents**

## CRYSTALLIZED INDICATOR DYES

Our standardized indicators cover a wide range of H-ion concentration, each indicator having been standardized to conform to the specifications of W. A. Clark and H. A. Labs.

These indicators are supplied in 1, 5, and 25 gram glass-stoppered bottles.

Benzopurpurine B  
 Bromocresol Purple

Recommended as a substitute for litmus, covering its entire range, and exhibiting sharper and more brilliant color changes. Range:  $pH$  5.2 to 6.8. Color: Yellow-purple.

Bromophenol Blue  
 Range:  $pH$  3.0 to 4.6. Color: Yellow-blue.  
 Bromothymol Blue

Recommended as a substitute for litmus in practically all tests and titrations. Exhibits sharper and more brilliant color changes. Range:  $pH$  6.0 to 7.6. Color: Yellow-blue.

Cresolphthalein  
 Cresol Red  
 Crystal Violet  
 Fuchsin  
 Indigotine  
 Litmus  
 Methyl Orange  
 Methyl Red

Range:  $pH$  4.4 to 6.0. Color: Red-yellow.  
 Methyl Violet  
 Methylene Blue  
 Zinc salt, also zinc-free  
 Phenolphthalein  
 Phenol Red

Range:  $pH$  6.8 to 8.4. Color: Yellow-red.  
 Resorcinol Blue (Lacmoid)  
 Thymol Blue-Acid  
 Range:  $pH$  1.2 to 2.8. Color: Red-yellow.

Thymol Blue-Alkaline

Range:  $pH$  8.0 to 9.6. Color: Yellow-blue.

This dye serves as the combination of the two indicators, Congo Red and Phenolphthalein, since it shows sharp and brilliant color changes over the two widely separated working ranges. It is especially recommended for differential titrations as well as for general routine analysis.

Trinitrobenzene  
 Tropaeoline OO

## STANDARDIZED INDICATOR SOLUTIONS

We are prepared to furnish all of our standardized indicators in solution (alcoholic and aqueous) in 100 cc. glass-stoppered bottles, which are specially sealed to prevent evaporation, entrance of dust, and deterioration. Strengths: 1 and 5 per cent. Special strengths prepared on request.

## STANDARDIZED SYNTHETIC CHEMICALS

These materials represent the highest quality obtainable, our methods for standardizing them include a careful analysis of the finished product and practical testing in some of its more common uses. These are supplied in 100, 250, and 500-gram glass-stoppered bottles.

Acetone, 100%

For determining the dielectric constants of pure compounds.

Aniline, 100%

Nearly colorless, free from benzene and nitrobenzene. Boiling-point  $183^{\circ}$  to  $184^{\circ}$  C.; freezing-point  $-5^{\circ}$  C.

Aniline Hydrochloride

White crystals, free from aniline. Melting-point  $198^{\circ}$  C.

Aniline Sulfate

White crystals, free from aniline and acid.

Anthranilic Acid

White crystals. Melting-point  $145^{\circ}$  C.

Ammonium Sulfate

White crystals. Melting-point  $140^{\circ}$  C.

Butyl Alcohol, Normal

In two grades: Special standard, and pure. Boiling-points  $117^{\circ}$  C.,  $118^{\circ}$  C., and  $116^{\circ}$ - $119^{\circ}$  C. respectively.

Cupferron

Creamy-white crystals. Special standard.

*Continued on Next Page*

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Barium Chlorate	Barium Sulphate
	Sulphate of Alumina
	Resinates (fused and precipitated)
	Oleates (fused and precipitated)
	Linoleates (fused and precipitated)

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# JOHN S. LAMSON & BROTHER, INC.

Cable Address  
"HARPLAK," New York  
Codes  
ABC, 4th & 5th Editions  
Bentley's  
Western Union, 5 Letter Edition

100 JOHN STREET, NEW YORK, N. Y.

BRANCH OFFICES  
Independent Oil & Supply Co.  
140 West Van Buren St.  
Chicago, Ill.

295 King St. West  
Toronto, Canada

WAREHOUSES  
New York, N. Y.  
Toronto, Can.  
Chicago, Ill.

## PRODUCTS

**Manganese Compounds; Asphalts; Pitches; Waxes;  
Manganese, Cobalt and Lead Driers; and Chemicals.**

## FOR PAINT, VARNISH, ENAMEL AND JAPAN MANUFACTURERS

### Natural Asphalts

Gilsonite, Manjak, Grahamite, Varnish-makers Black, Egyptian, South American, Barbados, West Indian and Trinidad Asphalts.

### Refined, Blown and Petroleum Asphalts

From California, Mexico, Trinidad and Mid-Continent fields.

### Manganese Driers

Borate, Resinate, Oxide, Sulfate, Chloride, Recovered, Hydrated, Linoleate.

### Cobalt Driers

Acetate, Hydrate, Linoleate, Oxide, Resinate, Sulfate, Carbonate, Chloride.

### Lead Driers

Resinate, Linoleate, Stearate.

### Pitches

Stearine, Cotton-seed, Palm Oil, Bone, Candle, Burgundy, Swedish, Refined.

### Pigments

Carbon gas-black, Imported Lithopone, Powdered Asphalt, Turkey Umber, Siennas.

## FOR FLASHLIGHT, DRY AND STORAGE BATTERY MANUFACTURERS

Manganese oxide (all grindings), Zinc chloride, Sal Ammoniac, Sealing-waxes and Asphalt compounds, Acid-resisting paints.

## FOR RUBBER GOODS MANUFACTURERS

Mineral Rubber (all melting-points), Blown Asphalt, Carbon gas-black, Red Rosin, Burgundy Pitch, Lithopone, Liquid Rubber, Dry Colors, Barytes.

## FOR GLASS AND PORCELAIN MANUFACTURERS

Manganese dioxide (all grindings), Precipitated or Recovered Manganese, Cobalt sulfate, Acid and Alkali Resisting Paints.

## FOR ELECTRIC CONDUIT, WIRE AND CABLE MANUFACTURERS

Stearine, Cotton-seed and Palm Oil Pitch, Mica Flour, Mineral Rubber, Montan, Ceresin, and Bee's-waxes, Weatherproof, Flame Proof, Saturating and Finishing Compounds.

## FOR PRINTING INK MANUFACTURERS

Stearine, Cotton-seed and Candle Pitches, Powdered Asphalt, Carbon gas-black, Manganese, Cobalt and Lead Driers, Ink-maker's Long-M Pitch.

## FOR METAL WORKING MANUFACTURERS

Sal Ammoniac, gray, granular, galvanizing, lump and imported grades, Zinc chloride, Acid and Alkali resisting paints.

## FOR CARBON PAPER MANUFACTURERS

Montan Wax, crude and bleached, Carnauba Wax, crude and refined, Carbon gas-black.

## FOR SHOE POLISH MANUFACTURERS

Montan, Bee's and Ceresin Waxes, Carbon gas-black.

## FOR BELTING, BRAKE LINING, CLUTCH FACING MANUFACTURERS

Gilsonite, Asphalt and Wax saturating compounds.

## FOR ELECTRICAL MANUFACTURERS

Sealing waxes and compounds, Insulating paints and varnishes, Impregnating and coil filling compounds.

## FOR ROOFING AND WATERPROOFING MANUFACTURERS

Natural, refined, blown and compound Asphalts, Cotton-seed, Candle, and Stearine Pitches, Montan, Insulating and Saturating waxes.

Established 1868

**JOHN D. LEWIS**

Manufacturers, Importers and Exporters

Turk's Head Building  
PROVIDENCE, R. I.

Boston, Mass  
Philadelphia, Pa

6 Cliff Street  
NEW YORK, N. Y.

Cable Address "LEWIS", Providence

Codes "ABC" 5th Edition and Improved, Western Union, 5 letter Edition, Bantley's

Cable Address "BIWELJOHN", New York

**PRODUCTS**

Industrial Chemicals, Tanning Materials, Natural  
Dyestuffs, Crude Rubber, Crude Drugs, Gums and  
Spices.

**ACIDS**

Citric, Crystal and Powdered; Kegs—112 lb.  
Formic, 85%; Boxed Carboys—66 lb.  
Oxalic, Prime White Crystals; Casks—650 to 700 lb.  
Tannic, Commercial Grades; Barrels—350 lb.  
Tartaric, Crystal and Powdered; Kegs—112 lb.,  
Casks—560 lb.

**CHEMICALS**

Acetate of Chromium; Barrels—400 to 500 lb.  
Acetate of Soda; Barrels—300 lb.  
Arsenic; Kegs—560 lb.  
Bichromate of Potash; Casks—650 to 700 lb.  
Bichromate of Soda; Casks—650 to 700 lb.  
Blue Vitriol (Sulphate of Copper); Barrels—450 lb.  
Caustic Potash 88/92%; Drums—700 lb.  
Caustic Soda, Solid 76%; Drums—650 to 700 lb.  
Caustic Soda, Ground 76%; Barrels—450 to 500 lb.  
Chlorate of Potash, Crystal and Powdered; Kegs—  
112 lb.  
Chlorate of Soda, Crystal and Powdered; Kegs—  
112 lb.  
Chloride of Magnesium; Casks—900 lb., Drums—  
600 lb.  
Chloride of Barium; Casks—700 lb.  
Epsom Salt (Sulphate of Magnesium); Casks—600  
to 700 lb., Bags—220 lb.  
Naphthalene; Balls, Crystal, Crushed, Flake, Pow-  
dered, Prime White—Melting-point 79° Plus; Barrels  
—200 to 300 lb., Casks—500 to 600 lb., Bags—200 lb.  
Nitrite of Soda 96/98%; Casks—500 to 600 lb.  
Prussiate of Potash, Yellow; Casks—600 to 700 lb.  
Prussiate of Soda, Yellow; Casks—500 to 600 lb.  
Soda Ash 58%; Barrels—300 lb., Bags—150 to  
300 lb.  
Sulphide of Soda 60/62% Fused; Drums—700 lb.  
Sulphide of Soda 60/62% Chipped; Barrels—500 lb.  
Sulphur  
Broken Rock Brimstone, 100% Pure.  
Barrels—500 lb., Bags—250 lb.  
Roll Brimstone, 100% Pure  
Barrels—360 and 500 lb., Bags—150 lb.  
Cone Brimstone, 100% Pure  
Barrels—360 and 500 lb.  
Flour, Heavy 100% Pure  
Barrels—290 lb., Bags—125 lb.  
Flour, Light 100% Pure  
Barrels—240 and 260 lb., Bags—125 and 150 lb.  
Sublimed Flowers 100% Pure  
Barrels—155 and 250 lb., Bags—100 lb.  
Commercial Flour 99½% Pure  
Barrels—300 lb., Bags—150 lb.  
Superfine Commercial Flour 99½% Pure  
Barrels—210 lb., Bags—125 lb.  
Precipitated, 100% Pure  
Barrels—125 lb.

Lac, 100% Pure

Barrels—125 lb.

Zinc Oxide; Barrels—450 to 500 lb.

**NATURAL DYESTUFFS AND TANNING MA-  
TERIALS**

Cutch; Cases—112 lb.  
Fustic Extract; Barrels—300 lb.  
Gambier; Bags—150 lb., Cases—112 lb.  
Hematin Crystals; Barrels—300 lb.  
Hematin Paste; Barrels—400 to 500 lb.  
Logwood Crystals; Barrels—300 lb.  
Logwood Extract, Liquid; Barrels—400 to 500 lb.  
Logwood Extract, Solid; Cases—50 to 60 lb., Bar-  
rels—300 lb.  
Sicily Sumac, Ground, 28%; Bags—160 lb.

**CRUDE DRUGS**

Barks  
Herbs  
Leaves  
Roots  
Seeds  
In original packages  
Licorice Paste  
Special 88% Soluble in Cold Water

**GUMS**

Arabic, Clean Amber Sorts  
Karaya  
Tragacanth  
Packed in Bags, Baskets and Cases

**VARNISH GUMS**

Congo  
Damar, Singapore  
Damar, Batavia  
Kauri  
Manila  
Soluble Manila  
Pontianac  
All East India Gums

Packed in Bags, Baskets and Cases

**SPICES**

Celery Seed  
Paprika  
Pepper  
Packed in Bags and Cases

**CRUDE RUBBER**

African  
Balata  
Central  
Gutta Percha  
Para  
Plantation  
In original packages

**MISCELLANEOUS**

Copra; Bags—200 lb.  
China Wood Oil; Casks—50 Gal.  
Turmeric, Ground; Barrels—300 lb.  
Desiccated Cocoanut; Cases—130 lb.

# THE LIQUID CARBONIC COMPANY

GENERAL OFFICES

CHICAGO, ILL.

## FACTORIES

New York, N. Y.  
Philadelphia, Pa.  
Chicago, Ill.  
Boston, Mass.

Cincinnati, O.  
Dallas, Tex.  
Memphis, Tenn.  
Atlanta, Ga.  
Long Island City, N. Y.

Minneapolis, Minn.  
St. Louis, Mo.  
Kansas City, Mo.  
Pittsburgh, Pa.

## DISTRIBUTING DEPOTS

Birmingham, Ala.  
Charlotte, N. C.  
Columbia, S. C.  
Jacksonville, Fla.  
Rochester, N. Y.  
Havana, Cuba  
Detroit, Mich.  
Indianapolis, Ind.  
Providence, R. I.  
Denver, Colo.  
Milwaukee, Wis.

## PRODUCT

**Carbon Dioxide 99.9 10% Pure.**

## METHOD OF MANUFACTURE

Manufactured by a chemical process, then compressed to a liquid and furnished to the consumer in steel cylinders. Our method is the well known coke process which absorbs the gases formed by burning coke, in a Sodium Carbonate Solution, the bicarbonate thus made being decomposed by heating and absolutely pure carbon dioxide evolved. The slight amount of impurity can, therefore, only be a trace of air and moisture. From outside appearances and in many details our plants are highly developed power plants.

## PHYSICAL PROPERTIES

Carbon Dioxide is a colorless Gas with a slight pungent odor. It is heavier than air, with a density of 1.52.

The Gas is compressed at our plants to a pressure of approximately 1000 lbs. per sq. in. depending on the temperature of the cooling water, when it forms a clear liquid slightly lighter than water. The latent heat is 123.2 B. T. U. The boiling-point is 79° C. and the critical temperature 31.35° C.

## USES

Carbon Dioxide, although still used to a large extent for carbonating beverages, is finding many uses in the manufacturing and chemical world.

An example of the chemical use of Carbon Dioxide is in the Kolbe or Schmitt processes to manufacture Synthetic Salicylic Acid, the important dyestuff and medicinal intermediate.

Many other uses are being made and research laboratories all over the country are investigating new applications, and within the past year we have secured for new customers, many chemical concerns.

As a cheap inert gas CO<sub>2</sub> has no equal, and because

of this, engineers are using the gas in large quantities. The active basis of most fire extinguishers being the formation of Carbonic Gas, we fill large numbers of cylinders to be used in putting out fires in oil tanks, pits, or where moisture would cause damage as by short circuiting electric connections. CO<sub>2</sub> can be used without danger to pump gasoline, and as an atmosphere which will prevent explosions.

A CO<sub>2</sub> cylinder is a ready source of compressed gas for power and is used in this way for atomizing liquids, inflating tires, operating switches, alarms, etc.

For small refrigerating units CO<sub>2</sub> has no equal and is especially valuable on battleships, in hotels and small plants where an irritating gas would be impossible to use. CO<sub>2</sub> is used by many physicians and dentists for local anesthesia.

## CONTAINERS

CO<sub>2</sub> is sold by weight in steel cylinders containing from 2 oz. to 50 lbs. The standard sizes are 20 and 50 lbs. and this company has thousands of such cylinders which are loaned to our customers.

## SERVICE

The Liquid Carbonic Company is the oldest and largest manufacturer of liquefied Carbon Dioxide in the United States. The total annual capacity of its plants is over thirty million pounds. Double units are erected at all large centers, and by means of stocks kept at distributing depots we are in a position to give quick service to our customers. New plants are being built at New York, Pittsburgh, Chicago, and several more are being considered.

The engineers at the General Office at Chicago are always available for information and their specialized knowledge may be of service in developing a possible use of pure CO<sub>2</sub>.





Established 1876

## DAVID McMEEKAN MANUFACTURING COMPANY

1070-1078 PACIFIC STREET, BROOKLYN, N. Y.

Telephone PROSPECT 2120-2121

SOUTHERN AGENTS The John M. Barr Company, Charlotte, N. C.



### PRODUCTS

#### Glues

Animal  
Cold  
Fish  
Flexible  
Liquid  
Vegetable

#### Gums

Liquid  
Arabic  
Tragacanth  
Karaya

Adhesives, of every description

Wall Paper Sizing, etc.

Softeners, Stiffeners and Finishes for Textiles

#### Oils "Mac-O" Brand

Soluble Oil Base  
Turkey Red  
Soluble  
Sulphonated

#### Greases

#### Waxes

#### Starches

Corn  
Tapioca  
Sago

#### Dextrine

#### "Nilsap"

For the softening and de-gumming of silk.

#### Tallows

Vegetable  
Soluble  
Sizing  
Tallow Compound

### MICA

Our connections with the miners of Mica, makes us the largest producers of Ground Mica in the World. We are therefore in a position to furnish Ground or Powdered Mica of every description at the lowest possible price consistent with quality and service.

Our No. 100 Mesh, Water Ground Mica, is washed free from Quartz and Feldspar, making same uniform, free from Grit and adapted for use in the Textile, Paper, Rubber and other industries.

We solicit inquiries and would be pleased to submit samples and quotations for either spot or future deliveries or to contract for your requirements over the year.

### ADHESIVES

"Thistle Brand" Cold and Liquid Gums, Glues and Adhesives are used without heat. Have proved superior to Animal Glues at a much lower cost. For use on Automatic Machines of every description, also for hand work.

### BREWERS AND BOTTLERS

Labeling Gums for use on all labeling machines, also for hand work.

### SILK MILLS

Our "Nilsap" is used in softening and degumming silk, doing away with the use of expensive Oils and Soap.

"Mac-o" Soluble Oil Base for making Oils, Tallows and Grease Soluble.

### PAPER MILLS

Our "Thistle Brand" Vegetable Tallow is used for the prevention of foam in the beaters, more efficient than Kerosene or Fish Oils and much lower in cost.

Splicing Gums  
Coating Size

### WALL PAPER MANUFACTURERS

Glue Substitute  
Gold Gum  
Mica, Ground and Pulp  
Silverine  
Dextrine  
Glue

### WOOLEN MILLS

"Mac-o" Soluble Oil Base for making Oils, Tallows and Grease Soluble.  
Soluble Oils, etc.

### AUTOMATIC LABELING, GUMMING, WRAPPING AND SEALING MACHINE, GUM AND GLUES

We manufacture a cold liquid gum or glue to suit each individual requirement.

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# JOSEPH A. McNULTY

SUCCESSOR TO G. A. & E. MEYER

ESTABLISHED 1805

**Direct Importer of Red Oxide of Iron and Dry Colors**

**114 Liberty Street**

**NEW YORK, N. Y.**

**Cable Address: "LYXSCAPEL"**

---

## PRODUCTS

<b>Strong Turkey Red</b>	<b>Rouge</b>
<b>Indian Reds</b>	<b>Polishing Powder</b>
<b>Permanent Tuscan</b>	<b>Rose Pinks</b>
<b>Turkey Red</b>	<b>Chromes</b>
<b>Venetian Reds</b>	<b>Greens</b>
<b>Purple Browns</b>	<b>Blues</b>
<b>Metallic Oxides</b>	<b>Yellow</b>
<b>Crocus</b>	<b>Blacks</b>

## IMPORTERS

We are importers of the finest grade Iron Oxide and Dry Colors, specializing in Turkey, Indian, Tuscan, and Venetian Reds, in many degrees of shade and strength for the Paint, Varnish, Rubber and Paper maker.

We furnish Pure Indian Reds for paint and varnish which have been used by the largest manufacturers for years, because of the dependable quality and uniform color.

Our Permanent Tuscan are also desirable, being made from the finest iron oxide and alizarine lake properly proportioned.

We have many shades of Turkey Red and Maroon Oxides, with the proper percentage of  $\text{Fe}_2\text{O}_3$  for the rubber manufacturers.

A fine line of Polishing Powder and Rouge for the Platers Supply Manufacturer and Glass Polishers

We supply standard grades, which can always be duplicated, the color and quality being warranted uniform.

We earnestly solicit inquiries and orders from manufacturers who desire the best. Prompt and courteous attention assured

**Agents in the United States for  
Leech Neal & Co.'s Red Oxides.**

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# MALT-DIASTASE COMPANY

79 Wall Street

NEW YORK CITY

Plant No. 1. 58-64 Garden St., Brooklyn    Plant No. 2. Wyckoff Ave. & Decatur St., Evergreen, L. I.

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## PRODUCTS:

"DIAX"  
 "TEXTASE" } De-Sizing Agents

## WHAT "DIAX" IS:

"Diax" is a Malt product with strong diastasic properties which is used to remove STARCHES and SIZING from COTTON AND COTTON MIXED GOODS. If properly used, will remove all sizing materials from the goods without shrinking or injuring them, and will leave the goods in a softer and better condition.

"Diax" is the strongest concentration of the enzymes of Malt, especially prepared under practical and scientific supervision for use in the process of BLEACHING, DYEING, PRINTING, MERCERIZING, FINISHING, and in the sizing and dressing of cotton yarns, etc.

## ADVANTAGES IN THE USE OF "DIAX."

**For Bleaching** Purer whites are obtained, less tendency to weaken fibres, saving of time and chemicals.

**For Dyeing** More level dyeings are obtained with economy of dyestuffs. Thorough degumming of previously dyed and finished goods is easily and cheaply performed.

**For Mercerizing** Has increased affinity of the cloth for the caustic liquor, gives better lustre, the mercerizing lye kept clearer and lasts longer.

**For Printing** It is especially useful in making adhesive sizes and finishes, is less expensive, and is devoid of color and easily removable.

**For Finishing** Thin fluid mixings are produced which penetrate the cloth better, giving superior results in the handle and feel of the cloth, and economy in the use of starch and dextrine.

## "TEXTASE":

"Textase" is very similar to "Diax" in every way except that it is not so strong.

## WRITE FOR FREE SAMPLES:

Free samples of either "Diax" or "Textase" will be sent for a demonstration.

# THE MATHIESON ALKALI WORKS, INC. Cable Address "ALKALICO", New York



GENERAL OFFICE  
25 WEST 43d ST., NEW YORK, N. Y.

BRANCH OFFICES  
Hospital Trust Bldg., Providence, R. I.  
Widener Bldg., Philadelphia, Pa.

WORKS  
Niagara Falls, N. Y.  
Saltville, Va.  
Commercial Nat'l Bank Bldg., Charlotte, N. C.  
Webster Bldg., Chicago, Ill.

## PRODUCTS

Caustic Soda  
Soda Ash  
Sesquicarbonate of Soda  
Bicarbonate of Soda  
Liquid Chlorine  
Bleaching Powder  
Chlorinated Solvents

## CAUSTIC SODA

60%, 74%, 76% and 78% Grades—"N. Y. & L." Test

Supplied in solid form, in hermetically sealed, steel drums, weighing approximately 750 lb. net.

The 78% Electrolytic Caustic (Castner Process), analyzing 98% Hydrate of Soda, is the purest caustic made, shipped in steel drums weighing approximately 730 lb. net.

Ground, Powdered and Flaked Caustic, packed in barrels, kegs and drums.

Pure Stick Caustic, for pharmaceutical and chemical purposes, packed in 5 and 10 lb. tins.

### ANALYSIS "EAGLE-THISTLE" BRAND CAUSTIC SODA

Constituents	Commercial grades					Pure stick
	60%	74%	76%	78%	78%	
Percentage content						
Sodium Hydroxide	76.07	84.00	96.27	98.4	98.07	
Sodium Oxide, Na <sub>2</sub> O actual	58.95	72.8	74.6	77.0	77.1	
Sodium Oxide, "N. Y. and Liverpool"	60.9	75.2	77.1	79.5	79.7	
Sodium Carbonate	2.08	1.85	2.01	1.2	1.80	
Sodium Chloride	20.00	2.58	0.84	0.220	0.20	
Sodium Sulphate	1.60	1.30	0.62	0.060	0.048	
Sodium Sulphide	none	none	none	none	none	
Silica, SiO <sub>2</sub>	0.05	0.05	0.05	0.021	0.002	
Alumina and Iron Oxide	0.11	0.08	0.08	0.008	0.007	
Calcium and Magnesium Carbonates	0.11	0.08	0.08	none	none	

## CAUSTIC BOTTOMS

60%, 74%, 76% Na<sub>2</sub>O—"N. Y. & L." Test

Suitable for rubber regeneration, water softening, etc.

## FLAKED CAUSTIC

Made in the 74% and 76% grades. Much more convenient and easier to handle than ground caustic, as it is practically free from dust and dissolves rapidly.

## PURE STICK CAUSTIC, C.P.

This Caustic is made by our Castner Electrolytic Process, is molded under conditions designed to protect and preserve its high purity. It is the purest Stick Caustic made in this market, and fully equals the best products made elsewhere. Intended, particularly for use in the manufacture of pharmaceutical chemicals, for laboratory purposes, etc.

## SODA ASH

Light, 58% Na<sub>2</sub>O—"N. Y. & L." Test. Sodium carbonate 99.23%.

Shipped in bulk or in 150, 200, and 300 lb. bags, also in barrels weighing approximately 300 lb. net.

Dense, 58% Na<sub>2</sub>O—"N. Y. & L." Test

Shipped in bulk or in 300 lb. bags, also in barrels weighing approximately 350 lb. net.

Our Dense Ash is densified in such a way, that the product is free from dirt, and particularly adapted for glass-making.

## VIRGINIA SODA

(Sesquicarbonate of Soda) A modified, neutral Soda, having approximately the following composition:

Sodium carbonate . . . 46.9%  
Sodium Bicarbonate . . . 31.17%  
Water of crystallization . . . 15.93%

Virginia Soda is particularly valuable for textile and laundry work, and the softening of hard water. Shipped in 300 lb. bags and in barrels weighing approximately 270 lbs. net.

**BICARBONATE OF SODA**—Standard, Powdered and Granular.

An exceptionally pure product, analyzing 99.92% NaHCO<sub>3</sub>.

Shipped in bags of 200 and 300 lb., kegs of 112 lb., and barrels of 400 lb., also in 16-oz. packages, packed 60 to the case.

## LIQUID CHLORINE

Our many years' experience in the manufacture of Liquid Chlorine enables us to ship this material in especially constructed one-ton containers, and 100 and 150 lb. cylinders. The only impurity is a slight trace of air, approximately 0.02%.

Our gray-painted cylinders are reserved exclusively for shipments to our water-works customers, and are carefully cleaned and inspected before refilling. The valves used on our cylinders are practically proof against injury, and it is almost impossible to strip their threads.

Our consumers of Chlorine are advised to use our one ton containers, thus saving freight and labor.

Our Technical Service Department will assist you in using Liquid Chlorine, particularly in making Bleach Liquor as needed.

## BLEACHING POWDER

The manufacture of quick settling, high-test, stable Bleaching Powder, is a delicate operation. Our many years' experience includes a careful study of limes, with the result that "Eagle-Thistle" Bleaching Powder is quick-settling.

Widely used in bleaching Paper Pulp, Textiles, also in the Sterilization of Water for drinking purposes, and as a Disinfectant and Deodorant.

Shipped in steel drums, weighing net 200 lb., 325 lb., 450 lb. and 800 lb. For export, in special steel drums, wooden lined, and specially painted inside and outside, —net weight 400 lb.

## SOLVENTS

Tetrachloroethane. C<sub>2</sub>H<sub>2</sub>Cl<sub>4</sub>

This solvent weighs 13.6 lb. per gallon.

Boiling-point approximately 147° C.

Shipped in iron drums,—400 lb. and 1400 lb. net.

Trichloroethylene. C<sub>2</sub>HCl<sub>3</sub>

This solvent weighs 12.4 lb. per gallon.

Boiling-point approximately 85° to 88° C.

Does not corrode metal apparatus. Its boiling-point is such, that large vapor losses are avoided and low enough that exhaust steam may be used in distillation. Useful in the extraction of alkaloids, fats, oils and rubber, etc.

# METALS & CHEMICALS EXTRACTION CORPORATION

• LEWIS, GILMAN & MOORE, INC.

NATIONAL GRAPHITE CO.

Hobart Building

SAN FRANCISCO, CALIF.

Works at Oakland, Calif.

Graphite Works at San Mateo, Mexico

## PRODUCTS

"Pacific White" Lithopone

"California" Blanc Fixe

Barium Carbonate

Barium Chloride

Bleached Barytes

Epsom Salts

Glauber's Salts

Salt Cake

Muriatic Acid

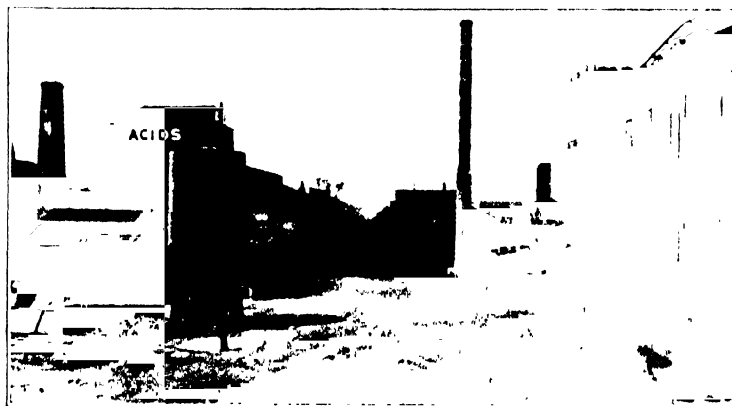
Nitric Acid

Sulphuric Acid

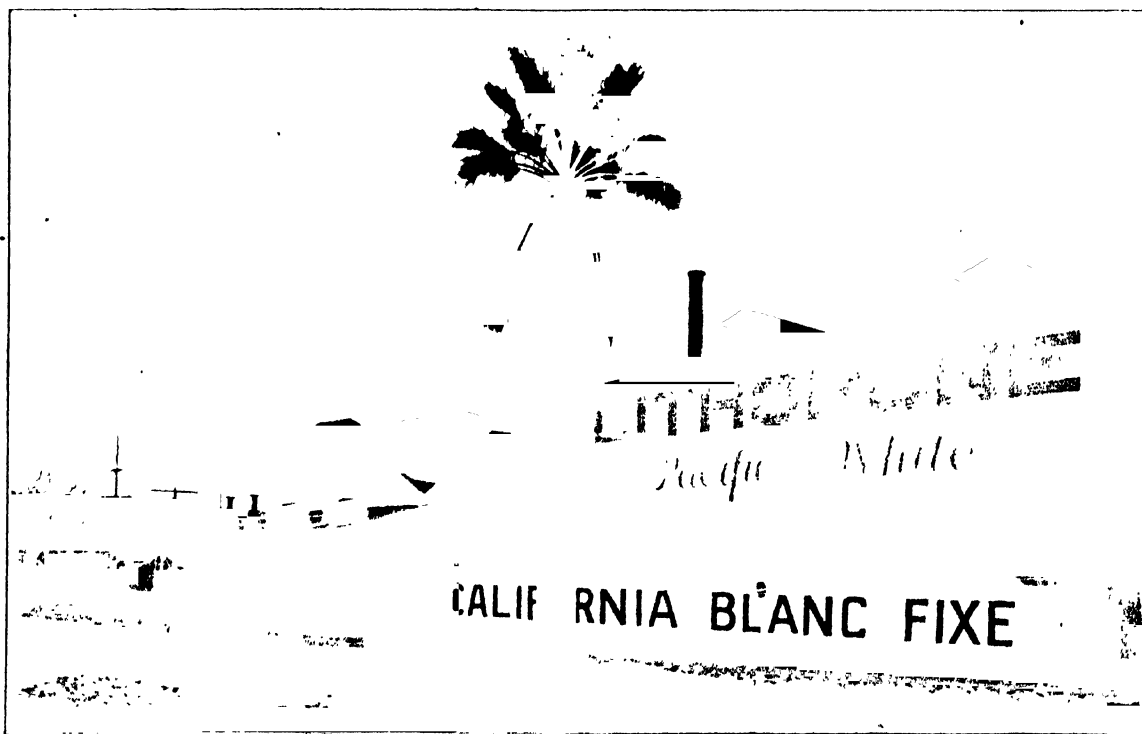
Zinc Chloride

Graphite

Rotary Gravure Inks



PARTIAL VIEW OF WORKS AT OAKLAND, CALIF.



PARTIAL VIEW OF WORKS AT OAKLAND, CALIF.



# H. A. METZ & CO., INC.

122 HUDSON STREET, NEW YORK, N. Y.

Cable Address  
"HAMETZ," New York

Boston, Mass.  
Philadelphia, Pa.

BRANCH OFFICES

Charlotte, N. C.  
Providence, R. I.

Chicago, Ill.  
San Francisco, Calif.

DISTRIBUTORS FOR

CONSOLIDATED COLOR AND CHEMICAL CO.  
NEWARK, N. J.

CENTRAL DYESTUFF AND CHEMICAL CO.  
NEWARK, N. J.

## PRODUCTS

Beta-Naphthol

Para-Nitraniline

Hydrosulphites

Dyestuffs

Acid

Basic

Chrome Colors

Direct Cotton

Nigrosines

Sulphur Colors

Oil Colors

Wood Stains

## ACID COLORS

Acid Navy Blue B

Amaranth

Azo Rubine

Bordeaux B

Crocene Scarlet

Erythrine

Fast Acid Red C2B

Fast Red

Naphthol Blue Black

Orange G

Orange I

Orange Y

Scarlet 2R

Victoria Scarlet 3R

Wool Violet RS

## BASIC COLORS

Bismarck Brown R

Bismarck Brown Y

Chrysoidine R

Chrysoidine Y

Malachite Green

Methylene Blue

Methyl Violet 3B

## CHROME COLORS

Alizarine Brown RG

Chrome Black A

Chrome Green CC

Chrome Green G

Chrome Yellow 2R

Chrome Yellow 3G

Chrome Yellow 5G

Delphine Blue

Gallocyanine

## DIRECT COTTON COLORS

Benzopurpurine 4B conc

Centraline Black BH

Centraline Blue 2B

Centraline Blue 3B

Centraline Violet N

Centraline Fast Red F

Direct Black

Direct Blue 2BO

Direct Blue H2G

Direct Dark Green C

Direct Yellow CJ

Direct Yellow DG

## NIGROSINES

Base

Spirit Soluble

## SULPHUR COLORS

Sulphur Blue 3B

Sulphur Brown C3R

Sulphur Brown K

Sulphur Brown 2F

Sulphur Catch R

Sulphur Fast Yellow G

Sulphur Maroon R

Sulphur Olive O

Sulphur Olive OD

Sulphur Orange Brown

Sulphur Tan Conc.

Sulphur Yellow R

## DYESTUFFS

Vat colors such as

Algol

Hydron

Helindon Blues

and other colors not obtainable from American manufacturers will be imported upon licenses issued by the War Trade Board.

Central and Consolidated Dyestuffs are scientifically produced in modern, efficiently maintained plants, by thoroughly experienced chemical engineers. They are always uniform in composition, and in all respects as good as their equivalents produced in or imported into this country in the past.

## USES

Dyeing cotton, wool, and silk yarns and textiles; coloring paper pulp and paper; producing writing, printing, lithographing, engraving, typewriter-ribbon, and rubber stamp-pad inks; dyeing and staining fur, leather and felt; pigmenting waxes, shoe and leather dressings, manufacturing color lakes.

## DEVELOPMENT

We are from time to time adding new dyestuffs to our extensive list, so as to be able to meet the constantly increasing demand for "Made-in-America" dyestuffs.

## SERVICE

Our chemists, dyestuffs experts, and our color-matching facilities are always available to assist you with your problems and difficulties in matching shades, selecting the appropriate dyestuff for a particular use, and in obviating disturbances in the operation of your dyehouse.

---

# J. MEYER & SONS

Manufacturing and Importing Chemists

480-482 BOURSE BUILDING

Cable Address  
"Meyerlus"

PHILADELPHIA, PA.

---

## PRODUCTS:

Chemicals for the Varnish, Paint, Glass, Steel, Oil Cloth, Printing Ink and Linoleum Trades. A full line of Varnish Gums.

## RESINATES Precipitated:

Manganese Resinate

Lead Resinate

Zinc Resinate

Calcium Resinate

## RESINATES Fused:

Manganese Resinate

• • • Lead Resinate

Zinc Resinate

Cobalt Resinate

## LINOLEATES:

Manganese Linoleate

Lead Linoleate

Calcium Linoleate

## STEARATES:

Calcium Stearate

Zinc Stearate

Aluminium Stearate

## MANGANESE COMPOUNDS:

Manganese Sulphate

Manganese Oxide, all grades

Manganese Chloride

Manganese Borate

## VARNISH GUMS:

Kauri Gum

Manila Copal

Damar Gum

Pontianak Gum

Ester Gums

## HARDENING POWDER FOR ROSIN

UMBER, BURNT AND RAW LUMP

# THE MINER EDGAR COMPANY

WAREHOUSES  
Brooklyn, N. Y.  
Newark, N. J.  
Cable Address  
MINEREDGAR, NEW YORK

Manufacturers of  
Wood Alcohol, Solvents, Lacquers and Clays

MAIN OFFICE  
110 WILLIAM STREET, NEW YORK, N. Y.

PLANTS  
Newark, N. J.  
Woonmouth Junction, N. J.  
Sutton, W. Va.  
Stamford, Vt.  
Rail & Water Facilities



Trade Mark

## PRODUCTS

### CLAY DEPARTMENT

Washed and Refined Clays for the manufacture of:

Book Paper  
Wall Paper  
Coated Paper  
Newspapers  
Dry Colors  
Paints and Kalsomine

Crude clays for news and wall paper mills. This is pulverized clay washed before pulverizing, insuring a uniform, absolutely gritless product.

### CHEMICAL DEPARTMENT

Acetic Acid

Acetate, Amyl  
Butyl  
Ethyl  
Methyl

Acetone, pure

Methylacetone

Formaldehyde

Alcohol, completely denatured

Alcohol, specially denatured (all authorized formulas)

Alcohol, Methyl, in following grades:

C. P. Methyl Alcohol  
Refined Wood Alcohol, all grades  
Wood Alcohol, denaturing grade

"Mecco" Spirits (Turpentine Substitute)

Acetone oils

## SERVICE

Put our research department to work for you.

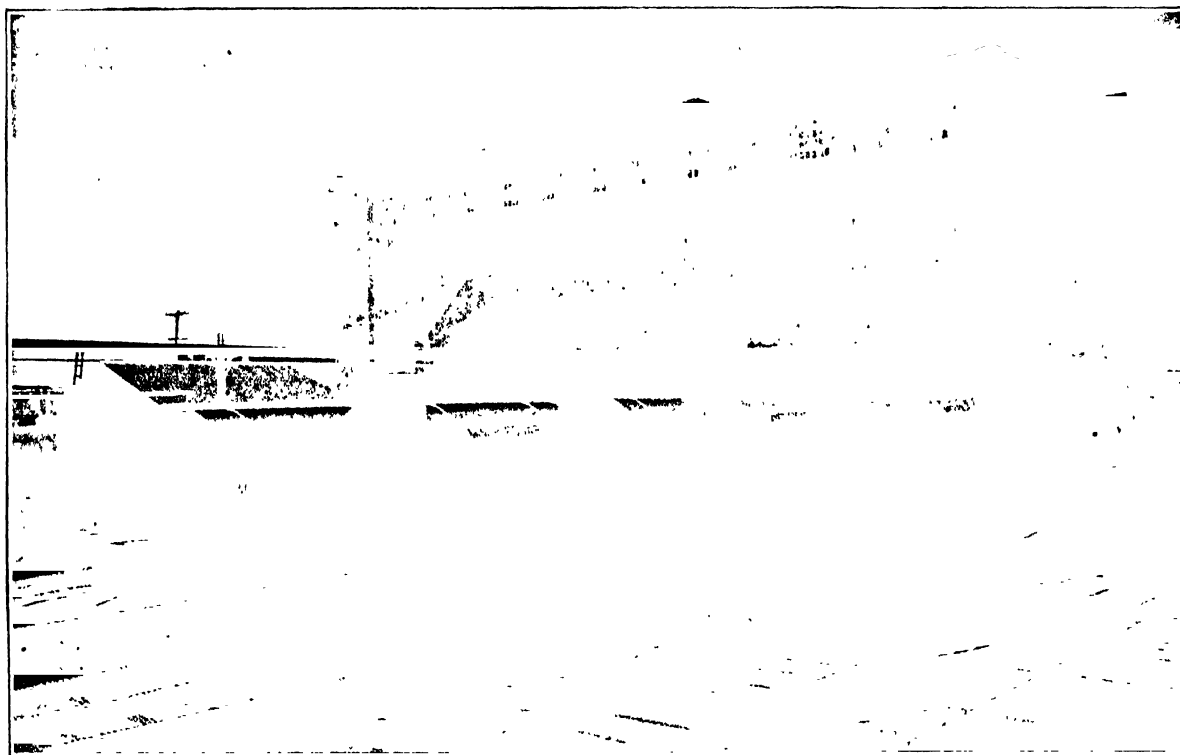
Many consumers of Solvents and Cotton Solutions are availing themselves of the services of this department, the personnel of which is made up of technical experts in the manufacture and uses of Solvents and Cotton Solutions.

We will assist you in successfully and economically meeting conditions which present themselves from time to time, and work with you in devising, developing and perfecting formulas and new processes to meet your particular requirements as they may be affected directly or indirectly by buying and selling conditions.

The production of Miner Edgar Solvents and Cotton Solutions is the culmination of a series of successive operations beginning with the mining of coal at our own mines, through the various steps involved in the manufacture of intermediates, and finally through to the finished products.

But this is where we stop, and therefore we are not competing with our customers.

The magnitude of our resources for crude materials from which most of our finished products are made, renders us independent of outside sources for our essential crude and intermediate materials, assuring our customers a steady and dependable source of supply.



OUR NEWARK, N. J. WAREHOUSE AND SHIPPER OF OUR LINE OF PRODUCTS



# THE MITCHELL LIME COMPANY

111 West Washington Street

CHICAGO, ILL.

PLANTS AND QUARRIES - Mitchell, Indiana



## PRODUCTS

**Mitchell Chemical Lime and Mitchell Hydrated Lime.**

### MITCHELL LIME

Mitchell Lime is calcined by experts from the finest hand-picked limestone. No shipment is released until it has passed our exacting inspection. Mitchell is recommended for use only after a careful study has been made of the particular requirements of the individual plant. These three facts are in themselves sufficient to account for the wide use of Mitchell Lime in chemical and metallurgical manufacturing.

A request for information regarding the specialized service accompanying the sale of Mitchell, will be given prompt attention. The value of this service has been demonstrated in the following industries:

#### Agriculture

Bacteria (Protection of)  
Direct Use on the Soil  
In Prepared Fertilizer  
Insecticides  
Lime and Wood Ash Mixtures  
Spraying Material

#### Building and Construction

Gypsum Products  
In Concrete  
Mortar  
Plaster  
Sand-Lime Brick  
Slag Brick  
Stucco

#### Caustic Alkali Works

Ammonia  
Caustic Soda  
Potash Salts  
Soda Ash

#### Explosives

Cyanamid  
Gelatine  
Glycerine  
Nitrates  
Preparation of Gun Cotton

#### Chemical Works

Alcohol  
Dehydrating of  
Manufacture of  
Wood Distillation  
Barium Products  
Bleaching Powder  
Bone Ash  
Calcium Acetate  
Calcium Carbide  
Manufacture of Acids  
Phenol  
Potassium Cyanide  
Precipitated Calcium Carbonate  
Recovery of Potash  
Salt Refining  
Sodium Cyanide  
Dyestuffs  
Glue Manufacture

#### Coke and Gas Manufacture

Coal Gas and Water  
Gas Purification  
Coke Oven By-products  
Gas Plant By-products

#### Leather Goods

Morocco Leather Industry  
Tanneries  
Dehairing Wool

#### Glass Manufacture

Bottle Glass  
Glass Tubing  
Glass Ware  
Optical Glass  
Plate Glass  
Window Glass

#### Metallurgy

Aluminum Manufacture  
Brass Manufacture  
Electric Furnace Flux  
Iron Blast Furnace Flux  
Metal Pickling  
Recovery of Copper from Smelter Chimney Dust  
Recovery of Gold  
Smelter Flux  
Steel Manufacture  
Steel Purification  
Detinning

#### Miscellaneous Industries

Asphalt Industry  
Cork Carpet and Linoleum Manufacture  
Corn Products Manufacture  
Cotton and Thread Manufacture  
Flour Manufacture  
Medical and Proprietary Uses  
Polishing and Buffing Compounds  
Porcelain Manufacture  
Pottery Manufacture  
Precipitated Chalk Manufacture  
Print Works  
Rubber Manufacture  
Pharmaceutical Products  
In mixture with glue for Veneer Construction

#### Oil, Fat and Soap Manufacture

Candles  
Glycerine  
Lubricating Grease  
Neutralizing Acidity of Oils  
Renovation of Butter  
Renovation of Grease Soap

#### Paint Manufacture

Calcimine  
Cold Water Paints  
Putty  
To Hold Heavy Materials in Liquid Suspension  
Varnish  
Whitewash

#### Paper Industry

Cooking Paper Stock  
Rag Process  
Soda Process  
Straw Board  
Sulphate Process

#### Refractory Materials

Ganister Brick

#### Sanitation

Chloride of Lime  
Disinfectants  
Neutralization of Acid Water  
Prevention of Putrefactive Ferments  
Sewage and Garbage Purification  
Water Purification  
Water Softening

#### Sugar Manufacture

Refining  
Recovery of Milk  
Sugar from Whey

# MUTUAL CHEMICAL COMPANY OF AMERICA

Manufacturers Exclusively

110 WILLIAM ST., NEW YORK, N. Y.

Cable Address: BICHROME, New York  
A. B. C. CODE, 4th, 5th and 6th Edition  
WESTERN UNION TELETYPE Edition

## FACTORIES

JERSEY CITY, N. J. BALTIMORE, MD.  
BALTIMORE WORKS FOUNDED IN 1846

## PRODUCTS

**Bichromate of Soda**

**Bichromate of Potash**

**"Koreon"**

**Sulphuric Acid**

## BICHROMATE OF SODA (Sodium Bichromate)

$\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$

### Mutual Standard

Uniformity

66 $\frac{1}{2}$  to 67 $\frac{1}{4}$ % Chromic Acid

Dissolves in water with practically no residue

Small crystals and Large crystals

### Shipping Containers

Wooden casks containing about 700 pounds

### Uses

Chrome tanning of leather,

Mordant in textile dyeing,

Oxidizing agent,

Insolubilizing gelatin and gums,

Bleaching oils, waxes and sponges,

Waterproofing fabrics,

Battery fluid,

Production of chromic acid,

Substitute for potassium bichromate.

## SULPHURIC ACID

$\text{H}_2\text{SO}_4$

Strength 60° Bé

Made from brimstone at our Jersey City factory.

### Shipping Containers

Tank cars of about 7000 gallons capacity.

## BICHROMATE OF POTASH (Potassium Bichromate)

$\text{K}_2\text{Cr}_2\text{O}_7$

### Mutual Standard

Uniformity

67 $\frac{1}{2}$  to 68 $\frac{1}{4}$ % Chromic Acid

Dissolves in water with practically no residue

Crystals and Powdered

### Shipping Containers

Wooden casks containing about 775 pounds

### Uses

Chrome tanning of leather,

Mordant in textile dyeing,

Oxidizing agent,

Insolubilizing gelatin and gums,

Bleaching oils, waxes and sponges

## "KOREON"

Trade name for a Basic Chromium Sulphate preparation of the same standard of uniformity and excellence as all Mutual products

Dissolves readily in water to a clear solution.

### Shipping Containers

Wooden casks containing about 500 pounds.

### Uses

Tanning hides and skins by the "one-bath" chrome tanning process.

# NATIONAL ANILINE & CHEMICAL CO., INC.

21 BURLING SLIP, NEW YORK, N. Y.



## BRANCH OFFICES

Akron, O.  
Boston, Mass.  
Charlotte, N. C.  
Chicago, Ill.  
Montreal, P. Q.

Hartford, Conn.  
Philadelphia, Pa.  
Providence, R. I.  
San Francisco, Calif.  
Toronto, Ont.

Cable Address  
"JUBILANT," New York  
WORKS

Buffalo, N. Y.  
Brooklyn, N. Y.  
Marion, Ind. Pa.

## PRODUCTS

Dyestuffs  
Intermediates  
Organic Chemicals  
Certified Food Colors

## DYESTUFFS

In the "National" line will be found a complete range of colors in the Acid, Basic, Chrome, Direct and Sulfur groups of dyes, as well as Developed Black, Blue and Red, Alizarine Blue, Orange and Red, Nigrosine, Indigo, Alkali Blue, Spirit Oil colors, Vat Black and Blue and Miscellaneous Bases. Type for type our line of nearly 300 dyes is equal to any made in the United States or imported into this country.

## INTERMEDIATES AND OTHER COAL-TAR DERIVATIVES

Below is a list of some of the principal intermediates and other coal-tar derivatives of standard quality that the National offers to the trade. These products are of technical importance to producers of textiles, dyestuffs, chemicals, pharmaceuticals, rubber products, photographic materials, paints, disinfectants, insecticides, etc.

Amido-1.5 Acid	Nitrobenzene
Amido-H Acid	Nitrotoluene
Aniline Oil	Nitroxylenes
Aniline Salt	Oil of Myrbane
Benzidine Base	Ortho-Nitrotoluene
Cleve's Acid	Ortho-Toluidine
Chromotropic Acid	Para-Aminoacetanilide
Dimethylamine	Para-Nitrosodimethylamine
Dinitrobenzene	lme
Dinitrotoluene	Para-Nitrotoluene Sulfonic
H Acid	Acid
Hydroquinone	Para-Toluidine
Koch Acid	R Salt
Metanilic Acid	Resorcin
Meta-Toluylenediamine	Schaeffer Salt
Methylene Blue, Medicinal,	Sulfanilic Acid
U. S. P.	Thiocarbamide
Mixed-Toluidines	Triphenylguanidine
Naphthionate of Soda	Xyldine

## CERTIFIED FOOD COLORS

These are manufactured to meet the stringent requirements of the U. S. Department of Agriculture, as to methods of manufacture, cleanliness and purity. Every pound is certified as being in conformity with the government specifications. It receives a certification number, which is plainly marked on each package.

The "National" Certified Primary Colors are as follows:

Amaranth No. 107  
Ponceau 3R 50  
Erythrosine No. 517  
Fauzazine No. 94  
Orange I No. 85  
Yellow A B  
Yellow O B  
Light Green S F Yellowish No. 435  
Sodium-Indigo Disulfonate No. 692

In some instances the primary colors do not produce the exact shades required. For such cases mixtures or blends are made, which are designated as secondary shades, and are again certified to the Bureau of Chemistry, U. S. Department of Agriculture.

The following list gives an idea of the variety of shades thus produced:

Bordorine	Noka
Ceylene	Rana
Kerine	Jonquiline
Rajah	Sitro
Rubaline	Mongola
Sulta	Yelcone
Benga	Solona
Vinta	Burno
Myrtine	Toki
Celetine	Perigee

Plumna

Additional shades now in process will be announced when ready.

## SERVICE

The Company maintains fully equipped laboratories and an experienced technical staff which are at the disposal of our customers without charge. Shade cards containing colors produced under actual dyeing conditions of the various trades are prepared for distribution to interested parties. Samples, prices, special formulae, dyeing instructions and advice in meeting specific dye problems are freely offered to our customers.

## INQUIRIES

May be addressed to our main office or the nearest sales office, and will receive prompt and careful attention.

## EXPORT

Foreign buyers should address their inquiries to  
NATIONAL ANILINE & CHEMICAL CO., INC.,  
Export Department,  
21 Burling Slip,  
New York, N. Y.

# NATIONAL ROSIN OIL & SIZE CO.

90 WEST STREET, NEW YORK, N. Y.

FACTORIES  
Savannah, Ga. Elizabeth, N. J.

WESTERN OFFICE AND WAREHOUSE  
Ashland Block, Chicago, Ill.

## PRODUCTS

Rosin Oil  
Pitches  
Pine  
Navy  
Burgundy  
Brewers'

Weatherproofing  
Insulating  
Venice Turpentine  
Pine-tar  
Pine-tar Oil

## ROSIN OIL

There are so many different processes used in the manufacture and refining of rosin oil, resulting in the production of so many different grades, that it cannot be stated that Rosin Oil in general has any salient characteristics. As a result, it can be adapted to a very great variety of uses. However, all pure rosin oils have as their basis the distillate of pure gum rosin. The various fractions of the distillation differ greatly, and a vast difference can be made in the nature of an oil by the temperature at which the distillation is conducted. All of these oils can be altered by one or more redistillations, blending of the various grades, deodorization and dehydration. Consequently, the color can be varied from a pale yellow through various shades of red to black, the viscosity from the consistency of the heaviest molasses to that of a thin paraffin oil, the acidity from 60 per cent. to neutral, and the odor from a strong characteristic pine odor to odorless.

In addition to the many grades of oil that are distillates of gum rosin, there are other varieties of so-called rosin oils. The first and most important of these are the oils that are blended with petroleum oils. There is a legitimate field for such oils, as they are cheaper than the pure distillates and highly efficient for many purposes.

We will never sell a blended oil until we have told our customer just what he is getting.

Some so-called Rosin Oils are made from dross, a waste product of the rosin still, or from dead pine wood, either directly or by the use of wood rosin derived from such wood. All such oils are inferior as they are apt to be dirty or to lack life even though their appearance may be good.

We positively guarantee all of our oils, whether pure or blended, to be made from pure gum rosin extracted from the living pine tree.

## GREASE OILS

Rosin Oil is used extensively in the manufacture of greases and we recommend the following grades:

Monarch Oil, Kidney Oil, No. 56 Kidney Oil, Atlas Oil, Bloom Oil, National Oil and Magic Oil.

## PRINTING INK OILS

This class of trade is most particular in its Rosin Oil requirements, and we cater to this trade. Our many years of experience have taught us the best oils for this use are:

Deodorized Second Run, Second Run Plain, and our Fourth Run EE Oil.

We also manufacture printing ink varnishes of various grades.

## BELT OILS

For the saturating of canvas belting we recommend our Gandy Oil, also our No. 300 Oil.

## RUBBER MANUFACTURERS' SUPPLIES

Among the largest users of our oils are numbered many internationally known rubber manufacturers and reclaimers. Their ideas as to which oils are best suited for their purpose vary widely and we are often called upon to produce special oils for them. Some of the most popular oils for the rubber industry are as follows:

No. 3 Deodorized, No. 556 and No. 342 Oil.

## INSULATING OILS AND COMPOUNDS

Insulating experts agree that for saturating paper cables, Rosin Oil has many desirable properties which cannot be obtained with any other compound. We recommend:

Dark Excelsior Oil, Blue Billy Oil and our Insulating Oil.

## OIL-CLOTH AND LINOLEUM OILS

Our Dark Excelsior and No. 305 Oils are used extensively in this industry.

## PITCHES

There are various grades of Pitch manufactured and we make all of them except the Coal-tar and Asphaltum Pitches which, although satisfactory for some purposes, cannot take the place of Rosin Pitches in others. Many years of experience have taught us what the ship chandlers, brush-makers, roofing manufacturers, druggists and brewers require, and where our Pitches are used, perfect satisfaction is given. We manufacture:

Caulking Pitch, Insulating Pitch, Brewers' Pitch, Brush Pitch and Burgundy Pitch.

Also various other special pitches.

## ISOLENE

This is a product manufactured from Rosin and is used extensively in the manufacture of paper cables. Isolene is free from moisture, high in acid and uniform, and produces a more flexible cable. Isolene also will make a tougher cable and will not crystallize, as is the case with Rosin.

We will gladly furnish samples on request.

**SEND FOR OUR BOOKLET ENTITLED  
"PINE TREE PRODUCTS"**

---

# NATIONAL SALES COMPANY

Miners and Importers

31-35 East 13th Street

CINCINNATI, OHIO

Cable Address  
NASCINC

---

## PRODUCTS

Arsenic  
Asbestos  
Barium Sulfate  
Barytes, Crude  
Bauxite  
Bentonite  
Bog Iron Ore  
Calcium Chloride  
Calcium Carbonate  
Calcite  
Clay  
    Acid-proof  
    Ball  
    Bleaching  
    China  
    Crucible  
    Fire  
    Glass-pot  
    Modeling  
    Pulverized  
    Refractory  
Cobalt Oxide  
Colloidal Clay  
Concrete Hardener  
Cotton Duck  
Chrome Ore  
Chromite  
Crucibles  
Feldspar  
Ferro-Chromium  
Ferro-Manganese  
Filter Bags  
Filter-press Bags  
Filter Cloths  
Filtering Mediums  
Fluorspar  
Filter Earth  
Fire Brick  
Flint Pebbles

Flint, Ground  
Floor Hardener  
Fuller's Earth  
Ganister  
Gas Purifying Oxide  
Glue, Powdered  
Infusorial Earth  
Insulating Materials  
Iron Oxide  
Kaolin  
Kieselguhr  
Limestone, Powdered  
Magnesite  
    Brick  
    Calined  
    Caustic  
    Crude  
    Dead Burned  
Magnesium Chloride  
Manganese  
Marble Dust  
Mica  
Mineral Fillers  
Ocher  
Paris White  
Press Bags  
Pumice, Powdered  
Pyrites  
Quartz for Acid Towers  
Quartz, Ground  
Quartz Rock  
Refractory Cements  
Silex Linings  
Silica, Ground  
Silica Sand  
Talc  
Tripoli  
Volcanic Ash  
Whiting  
Zirconium

# NATURAL CARBONIC GAS COMPANY

Producers of Carbon Dioxide, Liquefied, of Exceptional Purity

McCLELLAN STREET, NEWARK, N. J.

WORKS Waverly, N. J.

## PRODUCT

Carbon Dioxide

## FACILITIES

Our works, located in Newark, N. J., consisting of three separate and distinct plants, form the largest single Carbonic Gas producing plant in the United States and are equipped to produce Carbon Dioxide of exceptional purity. This consolidation of large producing capacity in several plants at Newark, N. J., which is an ideal shipping point for supplying the trade in the eastern states, and the concentration of our facilities at this point affords the opportunity of keeping every detail of the manufacture of our product under the control of our experts.

We use the efficient and reliable coke process, in which coke is burned, the gases formed being used to convert Sodium Carbonate in solution into the Bicarbonate. This is decomposed by heat yielding Carbon Dioxide, which is exceptionally free from impurities other than air and water, but which is further purified to reduce these impurities to a minimum.

The resulting Carbon Dioxide Gas is compressed, yielding Liquefied Carbon Dioxide, which is furnished to the user in the usual steel cylinders or gas bottles.

## PHYSICAL CONSTANTS

Gas: Specific gravity 1.53.

Liquid: Specific gravity 0.813; Melting-point  $-69^{\circ}\text{F}$ .

Latent heat 123.2 B. T. U.; Critical temperature  $-88^{\circ}\text{F}$ .

One pound of Carbon Dioxide is equivalent to about 8.25 cubic feet of gas at  $32^{\circ}\text{F}$ . and at atmospheric pressure.

## USES

In addition to its usual and long-standing utilization for carbonating beverages, Carbon Dioxide has many important uses in the chemical and other industries.

Among the former may be mentioned the manufacture of ammonium carbonate, the conversion of barium sulfide into the carbonate, and the production of synthetic salicylic acid.

In the production of sugar, especially beet sugar, the juice from the beets is treated with milk of lime, after which Carbon Dioxide is passed through it. This has the effect of removing certain impurities from the juice.

In the manufacture of white lead Carbon Dioxide is used in the "Carter" Process.

Being the cheapest inert gas available, increasing quantities of Carbon Dioxide are being used in many industrial processes among which the following are mentioned:

In the manufacture of rubber goods, where the product is inflated while being molded; or in molding of rubber goods under pressure.

For extinguishing fires, particularly in oil tanks and pits where water would be useless. Fires where there are many electrical connections which would be short-circuited by water are best extinguished by the use of Carbon Dioxide.

For power purposes, particularly where there is danger of fire, such as pumping gasoline, atomizing liquids, inflating tires, operating railway signals, etc., as well as for creating a non-explosive atmosphere above dangerous liquids.

For refrigeration, especially in small units, and where ammonia would be too dangerous and hazardous, as in hotels, on ships, etc.

For local anesthesia in surgery and dentistry.

For carbonating water for medicinal baths.

For food preservation by surrounding milk, fruits, meat and the like, with an atmosphere of  $\text{CO}_2$ .

In the chemical laboratory Liquid Carbon Dioxide finds extensive use for producing low temperatures, as low as  $-78^{\circ}\text{C}$ . By allowing a mixture of Liquid Carbon Dioxide and ether to evaporate in a vacuum the temperature can be reduced to  $-110^{\circ}\text{C}$ .

## CONTAINERS

Carbon Dioxide is furnished in **sealed** cylinders of two sizes, (a) containing 20 pounds, and (b) containing 50 pounds of Liquefied Carbon Dioxide.

## SERVICE

Our staff of chemists and engineers will gladly assist users of  $\text{CO}_2$  in any form, in obviating any difficulties encountered.

Prospective users of Carbon Dioxide will find our technologists ready at all times to assist in developing their processes, and to furnish any advice required.



# NIAGARA ALKALI COMPANY

NIAGARA FALLS, N. Y.

NEW YORK OFFICE: 18 EAST 41ST ST.

## PRODUCTS

### Caustic Potash, 88 to 92%

#### Average Analysis

Total Alkali,	88 to 92%
Potassium Chloride,	1.2 to 1.6%
Potassium Carbonate,	2.5 to 3.5%

	Containers	Dimensions
Broken Lump	100-lb. drums	14" x 23"
Solid	100-lb. drums	12" x 15"
Solid	700-lb. drums	21" x 32½"
Flaked	100-lb. drums	14" x 23"
Flaked	300-lb. drums	21" x 32½"

Other sizes on special order

Our Flaked Potash affords a ready means of making potash solutions of any desired strength with a minimum of time, effort and material

### 48° Be. Caustic Potash Solution

#### Average Analysis:

Total Alkali,	44 to 46%
Potassium Chloride,	0.6 to 0.8%
Potassium Carbonate,	1.2 to 1.7%

Returnable Steel Drums,	50 gals., 21" x 33"
Returnable Steel Drums,	100 gals., 32" x 43"

### Caustic Soda

#### Electrolytic

74% Actual  $\text{Na}_2\text{O}$ ; 76% N. Y. & L.

#### Average Analysis

Sodium Hydrate,	95.52%
Sodium Carbonate,	1.50%
Sodium Chloride,	2.77%
Sodium Sulphate,	0.11%
Sodium Sulphide,	none
Sodium Silicate,	0.16%
Sodium Oxide ( $\text{Na}_2\text{O}$ ),	74.90%

	Containers	Dimensions
Solid	100-lb. drums	12" x 15"
Solid	700-lb. drums	21" x 32½"
Flaked	100-lb. drums	14" x 23"
Flaked	300-lb. drums	21" x 32½"

Flaked Soda is meeting with a favorable reception where facility in handling, ease of dissolving, uniformity and freedom from waste are desirable

### 45° Be. Caustic Soda Solution

Returnable Steel Drums,	50 gal., 21" x 33"
Returnable Steel Drums,	100 gal., 32" x 43"

### Bleaching Powder

#### Average Analysis

35 to 37% Available Chlorine

Containers	Dimensions
800-lb. steel drums	30" x 39½"
300-lb. steel drums	21" x 33"
350-lb. wooden barrels	22" x 35"
100-lb. steel drums	16" x 20"
10-lb. cans	7" x 9½"

## Muriatic Acid

#### Average Analysis

Specific Gravity,	20 Be
Acidity as HCl,	31.45%
Non Volatile Matter,	0.089%
Iron,	0.0072%
Aluminum,	0.0054%
$\text{SO}_4$ (Sulphates),	0.0045%
Free Chlorine,	0.0105%
Lead,	none
Arsenic,	none

#### Containers.

Tank cars, or carboys

Please note that our Acid is entirely free from arsenic, lead or free sulphuric acid.

## Permanganate of Potash

Technical, 97 to 99%  $\text{KMnO}_4$   
U. S. P., 99% Minimum  $\text{KMnO}_4$

	Containers	Dimensions
25-lb. steel drums		12" x 6½"
50-lb. steel drums		12" x 12"
100-lb. steel drums		14" x 16¼"
250-lb. steel drums		21" x 19"

## Monochlorobenzol

#### Description—Water-white

#### Distillation

Below 127° C., no distillate  
Below 129° C., not more than 5% by volume  
Between 129°-133° C., not less than 90% by volume  
Between 133°-134.5° C., not more than 5% by volume  
Specific Gravity, 1.103 to 1.109 at 20° C. against water at 15° C.

#### Containers.

100 gal., Returnable Steel Drums, 32" x 43"  
Tank Cars

## Para-Dichlorobenzol

#### Description—White Crystalline Material

Melting-point about 53° C.  
Ash, 0.025% to 0.05%

#### Containers.

130-lb. wood kegs  
300-lb. standard wood barrels

## Ortho-Dichlorobenzol

#### Description—Straw Colored Liquid

Boiling-point 176°-179° C.  
Specific gravity, 1.280-1.350 at 15° C.

	Containers	Dimensions
100-gal. steel drums		32" x 43"



# NEWPORT CHEMICAL WORKS, INC.

PASSAIC, N. J.

Cable Address:  
NEWPORTCHEM, Passaic

TRADE MARK  
"COAL TO DYESTUFF"  
Reg. U. S. Patent Office

Boston, Mass.

Philadelphia, Pa.

Providence, R. I.

Chicago, Ill.

Greensboro, N. C.

BRANCH SALES OFFICES

## PRODUCTS

### Dyestuffs

Newport Series

Guaiacol

Intermediates

Sodium Silicate

Zinc Oxide

Zinc Chloride

## COAL TO DYESTUFF

The high quality of our products is made possible because the whole process of manufacture is performed by us. This includes: Mining the coal; coking the coal; recovering the by-products: Benzol, Toluol, Naphthalene, etc.; manufacturing from these products the various intermediates required; followed by the manufacture of the dyes themselves.

All dyestuffs are subjected to a careful standardization before delivery. This insures uniform shipments so that the user can be sure that each lot he receives is exactly like all preceding ones.

Our policy is "quality first" always, plus the determination to build a permanent 100% American Dyestuff industry.

## DYESTUFFS

At present we are producing dyestuffs as listed below, and are in a position to make immediate deliveries. They are in all respects the equal or superior of any imported dyestuffs available here in the past, either by direct importation, or by manufacture from imported intermediates.

They have been and are continuing to be used with highly satisfactory results in all branches of the textile industry, as well as by fur-dyers, manufacturers of inks of all kinds, paint-makers, varnish manufacturers, precipitation of lakes, in the wood-working industries for staining and coloring, and for the coloring of food products.

Being part of the "Coal to Dyestuff" system they are produced to create and maintain a standard.

Acid Black 4AN  
Acid Blue Black Conc.  
Acid Blue Black Extra Conc.  
Acid Bordeaux B Conc.  
Acid Fuchsine  
Acid Navy Blue BG  
Acid Navy Blue BR  
Acid Phloxine GR  
Acid Red 2B Extra  
Acid Red 6B Extra  
Acid Red OTH  
Acid Scarlet 2R  
Acid Violet 4BS  
Acid Violet 6R  
Amaranth  
Anthrene Blue GC, Paste  
Anthrene Blue GCD, Paste  
Anthrene Blue RS, Paste  
Anthrene Brown BB, Paste

Anthrene Dark Blue BO, Paste  
Anthrene Green B, Paste  
Anthrene Yellow G, Paste  
Azo Dark Green B  
Azo Eosine G  
Azo Eosine 2B  
Azo Rubine R  
Benzoazurine G Extra  
Benzopurpurine 4B Conc.  
Benzopurpurine 10B Conc.  
Chrome Blue G Extra  
Chrome Blue Black V  
Chrome Blue Black V Conc.  
Chrome Green C  
Chrome Green N  
Chrome Orange 2G  
Chrome Red A4B  
Chrome Yellow G  
Chrysophenine Extra  
Chrysophenine XXX Conc.  
Congo Red 4B  
Congo Red R  
Developed Black BH Extra Conc.  
Developed Black SC  
Developed Black 2BN  
Diazo Black RS  
Direct Black EE, Extra Conc.  
Direct Black 2G  
Direct Black RW  
Direct Blue 2B Conc.  
Direct Blue BXG  
Direct Blue 3B  
Direct Blue 3R  
Direct Brilliant Blue G  
Direct Brilliant Violet R Conc.  
Direct Brown GR Extra  
Direct Brown GXK  
Direct Brown RB  
Direct Fast Blue RW  
Direct Fast Brown MB  
Direct Fast Red F  
Direct Fast Scarlet 6BX  
Direct Fast Yellow NN  
Direct Garnet R  
Direct Green B  
Direct Green BXM  
Direct Green GXM  
Direct Green G  
Direct Green 2GB  
Direct Green 2Y  
Direct Heliotrope B  
Direct Orange R  
Direct Orange 2R  
Direct Orange 2RG  
Direct Pink 2B  
Direct Sky Blue  
Direct Sky Blue FF  
Direct Sky Blue 6B  
Direct Steel Blue G

*Continued on Next Page*



Direct Violet N  
 Direct Yellow G  
 Fast Acid Blue GG  
 Fast Acid Violet 10B  
 Fast Black V  
 Fast Black VC Extra  
 Fast Egyptian  
 Fast Red A  
 Fast Silk Gray MB Conc.  
 Lana Fuchsine B  
 Neutral Gray G  
 Oil Blue B  
 Oil Orange Extra Conc.  
 Oil Red 3BX  
 Oil Scarlet R  
 Oil Yellow  
 Primuline Extra Conc.  
 Rhodamine B Extra  
 Roccelline  
 Sulphur Blue RX  
 Sulphur Blue 4BXG  
 Sulphur Green G  
 Sulphur Indigo Blue B  
 Sulphur Indone 2R  
 Sulphur Indone 3B  
 Vat Dyes, see Anthrene  
 Wool Black B

It is our intention to add from time to time, additional dyestuffs to the above, so that we may always be in a position to fully meet all the demands of the American textile and allied industries.

Users of dyestuffs, who are unable to find available the particular dyestuffs to meet their special conditions are invited to lay their requirements before us, with assurance that these requirements will receive all the attention we can give them.

We maintain the fullest facilities for matching shades, solving dye-house difficulties and problems, and are always ready to serve our clients.

### INTERMEDIATES

In the course of our process "Coal to Dyestuff," we are producing not only the intermediates required for manufacturing the Newport series of dyestuffs, but also the following which, of course, are of the usual Newport standard of quality, and immediately available:

Alpha-Naphthylamine  
 Benzidine  
 Cleve's Acid  
 Dianisidine  
 Gamma Acid  
 H Acid  
 N-W Acid  
 Nitronaphthalene  
 Nitrotoluene, Ortho-  
 Nitrotoluene, Para-  
 R Salt  
 Sodium Naphthionate  
 Tolidine  
 Tolidine Sulfate  
 Toluidine, Ortho-  
 Toluidine, Para-

We are adding to this list as rapidly as manufacturing conditions permit, and the demand requires. Inquiries for intermediates not listed, will receive careful attention and consideration.

### GUAIACOL (Ortho-dihydroxybenzene methyl ester) $C_6H_4(OH)OCH_3$

We produce this in one quality only, complying in all respects with the requirements of the United States Pharmacopoeia.

**Grades:** Liquid and Crystal. The latter when melted may remain liquid for a long period of time, even at low temperatures.

**Shipping Containers:** Glass bottles (1, 2, and 5 lb.); tin cans (10, 20, and 50 lb.).

**Uses:** Medicine.

### SODIUM SILICATE (Water glass) $Na_2SiO_3$

A homogeneous solution, free from iron and sodium sulfide.

Soluble in water and alkalis; insoluble in alcohol and acids.

**Grades:** 40° B $\acute{e}$ .; 42° B $\acute{e}$ .

**Shipping Containers:** Barrels (50 gal.); iron drums (50 and 100 gal.); tank cars (5,000 gal.).

**Uses:** Adhesive in the manufacture of corrugated cardboard, mailing tubes, veneered wood products, etc.; fireproofing fabrics; greaseproofing paper containers, preservative for eggs; waterproofing walls; cementing stones, pipe insulation, etc.; refining cottonseed oil; binder in the manufacture of abrasive wheels and stones; in hydraulic and acidproof mortars.

### ZINC OXIDE (Chinese white; Zinc white) $ZnO$

Newport zinc oxide is of a good technical quality, and contains a minimum amount of zinc carbonate.

Specific gravity 5.50-5.85.

**Grades:** Technical.

**Shipping Containers:** Wooden kegs (50 and 100 lb.).

**Uses:** Paint pigment; rubber industry; production of zinc salts; manufacture of lithopone; smelting for zinc metal.

### ZINC CHLORIDE

**Grade:** Solution.

**Shipping Containers:** Barrels (50 gal.); iron drums (50 and 100 gal.); tank cars (5,000 gal.).

**Uses:** Wood Preservative.

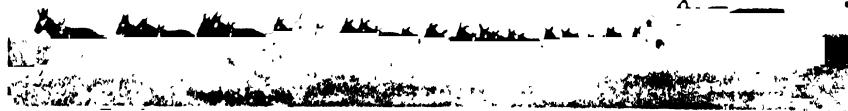
# PACIFIC COAST BORAX COMPANY

100 William Street

CHICAGO, ILL.

NEW YORK, N. Y.

SAN FRANCISCO, CALIF.



Cable Address: Boracic

## PRODUCTS

Ammonium Borate	Borax, U. S. P.
Borate of Manganese	Boric Acid, Anhydrous
Borax, Calcined	Boric Acid, U. S. P.
Borax Soap Chips	Boric Acid, U. S. P.
Borax, Fused	Granulated
Borax, Refined	Boric (Boracic) Acid,
Borax Soap	Refined
Muriate of Potash	

## REFINED BORAX

Crystal  
Granulated  
Powdered

This product is guaranteed 99½% pure, and is suitable for the manufacture of enameled ware, glass, bath tubs, pottery, gloss starch, leather and dyes; also for preserving food, such as hams and bacon, etc., for the British Government

## BORAX, U. S. P.

Crystal  
Granulated  
Powdered

This grade of Borax suitable for all pharmaceutical and medical purposes

## FUSED BORAX

This product is also known as Borax Glass and Anhydrous Borax. It is used in crystal, granulated and powdered form as a flux in refining refractory ores, in mineralogical determinations, also for brazing brass tubing.

## BORIC ACID, ANHYDROUS

Used as a flux and is also known as boric acid glass.

## AMMONIUM BORATE

Powdered

## MURIATE OF POTASH

For fertilizing purposes.

## CALCINED BORAX

This product is used as a flux

## BORATE OF MANGANESE

A dryer for inks, varnishes, paints, etc.

## REFINED BORIC (BORACIC) ACID

Crystal  
Granulated  
Powdered

This product is 99½% to 100% pure  $H_3BO_3$ . It is used for making glass and pottery ware, brazing tubing for automobiles, and is also allowed to be used as a preservative for codfish

## BORIC ACID, U. S. P.

Crystal  
Granulated  
Impalpable.  
Powdered

For pharmaceutical use where a product free from borax, chlorides, sulphates, heavy metals, etc., is required. The granulated form is advocated when a solution is desired. It is largely used to make efficient eye lotions.

## GRANULATED BORIC ACID, U. S. P.

Is a new form of Boric Acid which will dissolve more readily than any form hitherto introduced. The granules being porous dissolve almost instantly, making a solution in the shortest time possible

## BORAX SOAP

An excellent soap containing Borax.

## BORAX SOAP CHIPS

Contains 30% of Borax, which makes it an excellent cleanser.

PRICES SUBMITTED ON APPLICATION

# PALMER LIME AND CEMENT COMPANY

## High Calcium and Magnesium Lime

103 Park Avenue, NEW YORK, N. Y.

Cable Address  
"PALMERLIME", New York

### PRODUCTS

High Calcium Lump Lime and High Calcium Hydrate of special analysis are manufactured for special purposes.

### SERVICE

We operate six large High Calcium plants in Pennsylvania, our Magnesium plant is located at Dover Plains, N. Y. No other Lime manufacturer has facilities equal to these.

### HIGH CALCIUM, LIME

Two regular grades of Lump Lime and Hydrate Lime are manufactured.

#### ANALYSIS

##### Lump Lime (Quick Lime)

	Special	No. 1
CaO.	96.98%	92.95%
Mg. under	3%	5.3%
Insoluble under	2%	3.2%

##### Hydrated Lime

	Special	No. 1
CaO.	72.40%	70.20%
Mg.	3.10%	6.30%
Insoluble	1.84%	2.50%
Loss on Ignition	22.16%	21.00%

### TRAFFIC DEPARTMENT

We maintain a most efficient Traffic Department which is always at the service of our customers.

### MAGNESIUM LIME

Regular grades of Lump Lime and Hydrated Lime are manufactured.

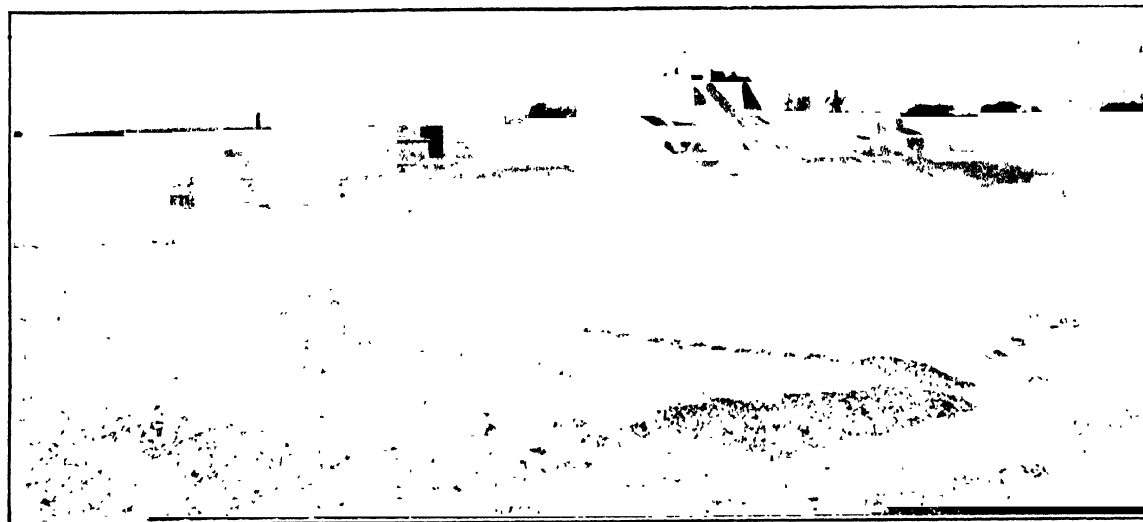
#### ANALYSIS

##### Lump Lime (Quick Lime)

CaO.	57.00%
Mg.	39.16%
Insoluble.	2.14%

##### Hydrated Lime

CaO.	45.85%
Mg.	31.88%
Insoluble	1.06%
Loss on Ignition.	17.55%



PALMER LIME & CEMENT COMPANY PLANT, YORK, PA.  
The most modern High Calcium Lime Plant in the United States

# THE PEERLESS WHITE LIME COMPANY



PLANT AND QUARRIES  
STE. GENEVIEVE COUNTY, MO.

SALES AGENT  
HUNKINS-WILLIS LIME & CEMENT CO.  
902 Century Building  
ST. LOUIS, MO.



## PRODUCTS

Special Chemical High Calcium Lump Lime.  
Special Chemical High Calcium Hydrated Lime, Extremely Fine Powder.  
Limestone for Chemical Purposes, Ground or Lump.

## PEERLESS WHITE LIME

Peerless White Lime, a special chemical lime, is of so high a lime (CaO) content that it is equalled by few and excelled by no other lime on the market. It can not be surpassed for purity and whiteness. Peerless White Lime runs uniform in quality, composition and purity at all times.

All Peerless White Lime is forked removing all the finer particles, thus insuring the shipment of nothing but fresh lump lime to our customers. This means that purchasers of Peerless White Lime receive more lime per ton than when kiln run lime is used.

## ANALYSIS.

Calcium Oxide	98.00 per cent
Iron Oxide	0.02 " "
Alumina	0.30 " "
Magnesia	0.45 " "
Silica	0.44 " "

## USES

Production of  
Bleaching Powder  
Calcium Carbide  
Calcium Carbonate, Precipitated  
Coke-oven By-Products  
Phenol  
Potassium Cyanide  
Tanning Industry  
Depilatory  
Manufacture of  
Acids  
Aluminum  
Brass  
Electric Furnace Flux  
Glass  
Glue

Iron Blast-Furnace Flux  
Paper  
Rubber  
Smelter Flux  
Soap  
Steel  
Water Paints  
Recovery of  
Copper from Smelter Chimney Dust  
Gold  
Potash  
Refining  
Salt  
Purification of  
Steel  
Water  
Metal Pickling  
Detinning

## SHIPPING CONTAINERS

We use the highest grade of lime cooperage obtainable, with two wire hoops per barrel, making a tight and secure package, preventing premature slaking.

## SPECIAL CONTAINERS

We use our patent paper-lined barrel, when desired, in shipping lump lime in barrels to prevent air-slacking. Lime in this package remains fresh without air-slacking indefinitely.

## SHIPMENTS

On account of its high lime (CaO) content, we believe that Peerless White Lime is shipped to more distant territory than any other lump lime produced in the United States. We are shipping regularly to large manufacturing plants in New York in the East and Oregon in the West, from Canada to New Orleans.

## SAMPLES

Requests for samples will be promptly honored, with strongest possible assurance that carloads shipped subsequently will equal the sample in all respects.

# PENNSYLVANIA SALT MANUFACTURING COMPANY

(Incorporated 1850)

## High Grade Heavy Chemicals

GENERAL OFFICES

Widener Building, PHILADELPHIA, PA., U. S. A.

WORKS

NATRONA, PA.

PHILADELPHIA, PA.

WYANDOTTE, MICH.

### PRODUCTS

#### ACIDS

Fuming Sulphuric (Oleum)  
Sulphuric (all strengths)  
Muriatic  
Mixed  
Nitric  
Acetic  
Glacial Acetic

#### ALUMS

Ammonia Alum  
Lump Alum  
Ground Alum  
Powdered Alum  
Filter Alum

#### ALUMINA

Hydrate  
Calcined

#### SULPHATE OF ALUMINA

"Natrona" Porous (Iron free)  
"Natrona" Concentrated (Iron free)  
Excelsior (Commercial)

#### SODA PRODUCTS

Bicarbonate of Soda  
Sal Soda  
Sulphate of Soda (Salt Cake)  
Bisulphate of Soda (Nitre Cake)  
Caustic Soda 60%, 74%, and 76% (electrolytic)

### LYE

Lewis Lye (High Test)  
Saponifier  
Greenwich Lye  
American Lye

### CHLORINE PRODUCTS

Bleaching Powder  
Liquid Chlorine  
Chlorine Gas  
Chlorinated Lime

### HYDROGEN GAS

### OTHER HEAVY CHEMICALS

Purple Ore  
Nodulized Iron Ore (for low phosphorous Pig Iron)  
Natrona Red Ore (for Gas Purifying)  
Mineralite Sponge Oxide (ready for Gas Purifying)  
Copperas  
Sulphate of Lead  
Chloride of Alumina

### SOLE IMPORTERS OF

GREENLAND KRYOLITH

### IMPORTERS OF

Rio Tinto Pyrites  
Bauxite  
Nitrate of Soda

### REFINERS OF

Copper  
Gold  
Silver



# CHARLES PFIZER & CO., INC.

Established 1849

Manufacturing Chemists  
NEW YORK, N. Y.



HOME OFFICE  
81 Maiden Lane, New York N. Y.

Cable Address  
"PFIZER," New York

WESTERN SALES OFFICE  
180 North Market St., Chicago, Ill.

## PRODUCTS

U. S. P. Chemicals for medicinal use, also a general line of Chemicals for Blue Print, Photographic, and other technical purposes.

**Citric Acid** 99½-100%

Crystals  
Powdered  
Granulated

**Tartaric Acid** 99½-100%

Crystals  
Powdered  
Granulated

**Cream of Tartar** 99½-100%

Crystals  
Powdered

**Rochelle Salt** 99½-100%

Crystals  
Powdered

**Seidlitz Mixture**

**Borax Refined** 99½-100%

Crystals  
Powdered  
Granulated

**Boric Acid** 99½-100%

Crystals  
Powdered  
Granulated

**Camphor Refined**

**Camphor Refined Powdered**

**Bismuth Subnitrate**

**Bismuth Subcarbonate**

**Bismuth Subgallate**

**Bismuth Subsalicylate**

**Bismuth Oxychloride**

**Potassium Citrate**

**Sodium Citrate**

**Chloroform**

**Tannin**

**Calomel** (Mild Mercurous Chloride)

**Red Precipitate** (Red Mercuric Oxide)

**White Precipitate** (Ammoniated Mercury)

**Corrosive Sublimate** (Corrosive Mercuric Chloride)

**Strychnine and Salts thereof**

**Sodium Salicylate**

**Tartar Emetic** (Antimony and Potassium Tartrate)

**Iron and Ammonium Citrate, U. S. P.**

**Iron and Ammonium Citrate Green Scales**

**Iron Citrate U. S. P. 8th Revision**

**Ferric Ammonium Oxalate**

**Ferric Potassium Oxalate**

**Ferric Sodium Oxalate**

**Ferric Oxalate Scales**

**Potassium Iodide**

Crystals  
Granulated

**Iodoform Powdered**

**Iodine Resublimed**

**Ammonium Iodide**

**Sodium Iodide**



# PHILADELPHIA QUARTZ COMPANY

Specialists in the Manufacture and Uses of

Silicate of Soda

• 121 SOUTH THIRD STREET, PHILADELPHIA, PA.

THE PHILADELPHIA QUARTZ COMPANY OF CALIFORNIA  
BERKELEY, CALIF.

## FACTORIES

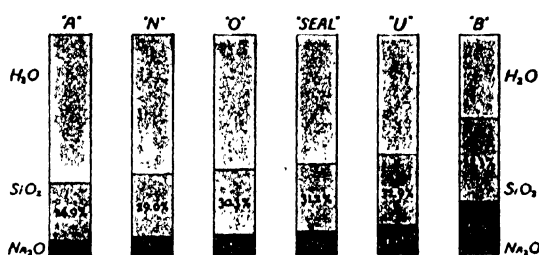
Chester, Pa.  
Rahway, N. J.  
Anderson, Ind.  
Gardenville, N. Y.  
Kansas City, Kans.

## PRODUCTS

Silicate of Soda in its various forms and Service in adapting Silicates to their possible uses.

## COMPOSITION OF SILICATE OF SODA

Silicate of soda is the general name applied to a group of glass-like materials soluble in water and composed of varying ratios of soda,  $\text{Na}_2\text{O}$ , and silica,  $\text{SiO}_2$ . The commercial grades may have percentage ratios of alkali to silica between 1:1.5 and 1:4. An attempt to produce a more alkaline silicate than 1:1.5 would lead to the formation of the definite crystalline compound  $\text{Na}_2\text{SiO}_3$ . To increase the silica beyond the ratio of 1:4 would yield a product too nearly insoluble to be commercially practicable. The properties of the solutions vary greatly as the compositions change, making possible the adaptation of silicate of soda for a great variety of uses.



COMPOSITION OF TYPICAL BRANDS OF SILICATE OF SODA

## GENERAL CHARACTERISTICS

All silicate of soda solutions are colloidal and set from the loss of water to form very hard and strong bonds. All the solutions show an alkaline reaction to litmus and other indicators, and some degree of "alkalinity" is one of the properties of all grades. The various silicates are unaffected by animal, vegetable or mineral oils, fats or greases. They may be mixed freely with neutral fillers, such as clay or silix, and many other substances. Excepting one special brand, all the grades of silicate, if air dried, will dissolve again on continued exposure to water, though the less alkaline grades are not appreciably affected by atmospheric dampness. Heat drives out more of the water from air dried silicates, and red heat softens them. Continued exposure of any silicate to the air results in a reaction with the carbon dioxide of the air.

## CHARACTERISTICS OF DIFFERENT BRANDS

Proper adjustment of the composition and concentration of the silicates, along with other special and often delicate processes, produces a wide range of properties. Some brands are quite fluid, others are syrupy, and still others are very thick and viscous. High alkalinity is a special feature in some, as for boiler compounds, low alkalinity in others, as for paper sizing and for acidproof cements. The following list of certain standard uses, and the brands best adapted for each, may be suggestive:

USE	BRAND
Soap Making	"N," "O"
Metal Cleansers	"Q"
Paper Sizing	"A," "A Syrup"
Corrugated Paper Board	"S," "N," "O"
Combined Board	"N," "O," "g"
Wall Board	"Q"
Coating Paper Board	"N"
Paper Barrels	"N"
Sealing Shipping Containers	"Sed"
Asbestos Air Cell Board	"Q"
China Cements	"O," "E," "U"
Box Shooks	"V8" No. 1 or No. 2
Trunk Manufacture	"V8" No. 2
Matching	"V8" No. 1
Abrasive Wheels	"J," "SB Powdered"
Boiler Compounds	"D," "U," "B"
Refractory Cements	"U," "BW," "Q," "N"
Acidproof Cements	"S," "A," "Q"
Digester Linings	"U," "Q"
Refining Cotton seed Oil	"N"
Egg Preserving	"E," "N," "Q"
Stainproofing Lumber	"N"
Hardwood Flooring	"N"
Barrel Testing and Sizing	"N"
Fireproofing and Insulating	"N"
Silica Gels	"N"
Silk Weighting	"Star," "E"
Peroxide Cotton Bleaching	"Star"
Boiling off Cotton	"Star"
Pottery Clays and Sagger Mending	"Star," "N"

## DEVELOPMENT SERVICE

New uses for silicates, and new silicates for special conditions, are continually being investigated. For many consumers, it has been our privilege to work out special modifications of the silicate used, or special methods of use. Our Chemical and Physical Laboratories are at the service of consumers, and we cordially invite correspondence regarding any problems in which our experience might be of value.

# POWERS-WEIGHTMAN-ROSENGARTEN CO.

Founded 1818

Manufacturers of Medicinal and Technical Chemicals  
NINTH & PARRISH STREETS, PHILADELPHIA, PA.

BRANCH OFFICES  
115 Front St., New York, N. Y. 309 S. Broadway, St. Louis, Mo.

Cable Address  
"MANPHIL", Philadelphia

## PRODUCTS

A general line of medicinal, technical and photographic chemicals.

**Acetanilide**

**Acetphenetidine**

**Acids**

Acetic	Hydrofluoric
Acetylsalicylic	Lactic
Arsenic	Molybdic
Arsenous	Nitric
Benzoic	Oleic
Boric	Oxalic
Carbolic	Phosphoric
Chromic	Pyrogallic
Citric	Salicylic
Formic	Stearic
Gallic	Sulphuric (Oil of Vitriol)
Hydrobromic	Tannic
Hydrochloric (Muriatic)	Tartaric

**Alums**

Ammonium	Ferric
Chrome	Potassium

**Aluminum**

Sulphate and other Salts

**Ammonia Water**—16°, 20°, 26° Be

**Ammonium**

Chloride, Sulphate and other Salts.

**Antimony**

Metal, and Antimony Chloride Solution.

**Arsenic Salts**

Arsenates and arsenites.

**Barium**

Carbonate, Chloride, Hydroxide, Sulphate and other Salts.

**Bismuth**

Metal, Nitrate, Subcarbonate, Subgallate, Subnitrate, Subsalicylate and other Salts.

**Borax**—Fused, Calcined.

**Bromine**

**Cadmium**—Metal and Salts.

**Caffeine**

**Caffeine Citrated**

**Calcium**

Bromide, Carbonate, Precipitated, Chloride and other Salts.

**Calomel**

**Chloroform**

**Chromium**

Chromates, Sulphate and other Salts.

**Cinchonidine** Sulphate and other Salts.

**Cinchonine** Sulphate and other Salts.

**Codeine** Sulphate, Phosphate and other Salts.

**Collodion**

**Copper**

Metal, Acetate, Sulphate and other Salts.

**Corrosive Sublimate**

**Cream of Tartar**

**Cyanides**

**Epsom Salt** (Magnesium Sulphate)

**Ether**

For Anesthesia, Concentrated.

Priming.

**Formaldehyde Solution**

**Glauber's Salt** (Sodium Sulphate)

**Glycerin**

**Gold Chloride** and other Salts

**Hexamethylenetetramine**

**Hydrogen Dioxide Solution**

**Iodine Resublimed**

**Iron**

By Hydrogen, Chloride Lumps, Chloride Solution, Nitrate Solution, Subsulphate Solution (Monsel's), Sulphate (Ferrous), and other Salts, and Ammonium Citrate Scales Brown, and Ammonium Citrate Scales Green, and other Scale Preparations.

**Lead**

Acetate, Nitrate and other Salts.

**Lithium**

Bromide, Carbonate, Citrate and other Salts.

**Lunar Caustic**

**Magnesium**

Carbonate, Oxide, Sulphate and other Salts.

**Manganese**

Dioxide, Sulphate and other Salts.

**Mercury**

Distilled, Redistilled and Salts.

**Morphine** Sulphate and other Salts.

**Nickel** Metal, Carbonate and other Salts.

**Potash Caustic**

**Potassium**

Acetate, Bromide, Carbonate, Chlorate, Citrate, Iodide, Nitrate and other Salts.

**Quinidine** Sulphate and other Salts.

**Quinine** Sulphate and other Salts.

**Red Precipitate**

**Rochelle Salt**

**Sal Ammoniac**

**Sal Soda**

**Sal Tartar**

**Silver** Nitrate and other Salts.

**Soda Caustic**

**Sodium**

Acetate, Bromide, Carbonate, Iodide, Phosphate, Sulphate and other Salts.

**Strontium**

Bromide, Carbonate Precipitated, Nitrate and other Salts.

**Strychnine** Alkaloid, Sulphate and other Salts.

**Sugar of Lead**

**Sulphur**

Flour, Flowers, Fused, Precipitated, Sublimed, Washed.

**Tannin**

**Tartar Emetic**

**Tin** Protochloride

**White Precipitate**

**Zinc**

Metal, Chloride, Chloride Solution, Oxide, Stearate, Sulphate and other Salts.



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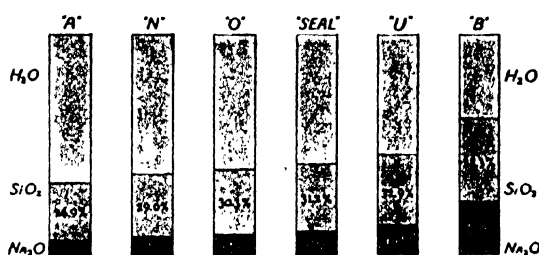
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Combined Board	"N," "O," "g"
Wall Board	"Q"
Coating Paper Board	"N"
Paper Barrels	"N"
Sealing Shipping Containers	"Sed"
Asbestos Air Cell Board	"Q"
China Cements	"O," "E," "U"
Box Shooks	"V8" No. 1 or No. 2
Trunk Manufacture	"V8" No. 2
Matching	"V8" No. 1
Abrasive Wheels	"J," "SB Powdered"
Boiler Compounds	"D," "U," "B"
Refractory Cements	"U," "BW," "Q," "N"
Acidproof Cements	"S," "A," "Q"
Digester Linings	"U," "Q"
Refining Cotton seed Oil	"N"
Egg Preserving	"E," "N," "Q"
Stainproofing Lumber	"N"
Hardwood Flooring	"N"
Barrel Testing and Sizing	"N"
Fireproofing and Insulating	"N"
Silica Gels	"N"
Silk Weighting	"Star," "E"
Peroxide Cotton Bleaching	"Star"
Boiling off Cotton	"Star"
Pottery Clays and Sagger Mending	"Star," "N"

## DEVELOPMENT SERVICE

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# RHODIA CHEMICAL COMPANY

SUBSIDIARY OF

"SOCIÉTÉ CHIMIQUE DES USINES DU RHONE," FRANCE

Manufacturers of Medicinal, Photographic and Industrial Chemicals

MAIN OFFICE

Cable Address  
"RHODIA", New York

89 FULTON STREET, NEW YORK, N. Y.

FACTORIES

New Brunswick, N. J., U. S. A.  
St. Fons, Rhone, France

Roussillon, Isere, France  
La Plaine, Switzerland

## PRODUCTS

### Pharmaceuticals

### Industrial Chemicals

### Photographic Chemicals

## PHARMACEUTICALS

Antipyrine (Phenazone, U. S. P.)

Ethyl Chloride, Rhodia

In tubes with automatic stoppers for local and general anesthesia

Piperazine Hydrate

Pyramidon, Rhodia

Resorcinol, U. S. P.

Crystal and powdered

Saccharin Soluble, U. S. P.

Crystal, granular and powdered

Saccharin Insoluble, U. S. P.

## INDUSTRIAL CHEMICALS

Benzyl Alcohol, Technical

Cellulose Acetate

For water-proofing and fire-proofing of tissues, etc., lacquers, varnishes, enameling, non-inflammable celluloid stock, etc.

Coumarin, Rhodia

Dimethyl Sulphate

Ethyl Chloride, Rhodia

In cylinders for refrigeration and technical purposes.

Resorcinol, Technical

## PHOTOGRAPHIC CHEMICALS

Hydroquinone

Monomethyl-para-amidophenol Sulphate

Our trade-mark "Rhodol"—same as Metol

# J. L. & D. S. RIKER, INC.

19 CEDAR STREET, NEW YORK, N. Y.

Cable Address  
"RIKER", New York

SELLING AGENTS FOR PRODUCTS OF

Niagara Alkali Co., Niagara Falls, N. Y.  
North American Chemical Co., Bay City, Mich.

National Electrolytic Co., Niagara Falls, N. Y.  
Oldbury Electro Chemical Co., Niagara Falls, N. Y.

## PRODUCTS

### Barium Chlorate

Kegs, Gross weight 145 lb.  
Net weight 130 "

### Bichromate of Potash

Casks, Gross weight 760 lb.  
Net weight 700 "

### Bichromate of Soda

Casks, Gross weight 670 lb.  
Net weight 600 "

### Bleaching Powder

Drums, Gross weight 318 lb.  
Net weight 300 "  
Also Drums of 700 "  
Drums of 100 "  
Cans of 10 "

### Caustic Potash

Drums, Gross weight 718 lb.  
Net weight 700 "

### Caustic Soda

Drums, Gross weight 718 lb.  
Net weight 700 "  
Gross weight 120 "  
Net weight 112 "

### Chlorate of Potash

Kegs, Gross weight 125 lb.  
Net weight 112 "

### Chlorate of Soda

Kegs, Gross weight 125 lb.  
Net weight 112 "

### Chrome Alum

Casks, Gross weight 570 lb.  
Net weight 500 "

### Formaldehyde 40% Vol.

Casks, Gross weight 530 lb.  
Net weight 450 "

### Oxalic Acid

Casks, Gross weight 320 lb.  
Net weight 300 "

### Red Phosphorus

Cases, Gross weight 175 lb.  
Net weight 110 "

### Sesquisulfide of Phosphorus

Cases, Gross weight 150 lb.  
Net weight 105 "

### Yellow Stick Phosphorus

Cases, Gross weight 200 lb.  
Net weight 110 "

## SPECIALTIES

### Paraformaldehyde

### Hexamethylenetetramine

### Chrome Sulphate

Weights and measurements of Export Packages  
will be given on application.

# ROBESON PROCESS COMPANY

200 Fifth Avenue, NEW YORK, N. Y.

OPERATING PLANTS

AUSABLE FORKS, N. Y.

COVINGTON, VA.

## PRODUCT

### SPRUCE EXTRACT

## MANUFACTURE

Robeson Spruce Extract has been manufactured by this company for over ten years. The process is under constant supervision of experienced chemists. The product is manufactured under patents owned and controlled by this company and we do not license any other manufacturer to use them.

## PURITY

All impurities, which are detrimental to leather are removed during our process and we ship extract made especially for the tanning trade.

## UNIFORMITY

As both our plants use the same process and are under the same supervision, our product is always uniform.

## SHIPMENT

We make shipments in tank-cars where the plants are equipped with suitable storage tanks, it being much more economical to handle the material in this way. We also make shipments in barrels.

Our Covington plant is well equipped to take care of the Southern, Central and Western trade.

Our Ausable plant takes care of our Northern and Canadian trade.

We own and operate our own tank-car line, which assures prompt shipment in cars properly equipped to handle tanning material.

## USES

Robeson Spruce Extract has been the recognized standard for many years in the largest tanneries in the United States and Canada on account of its adaptable quality.

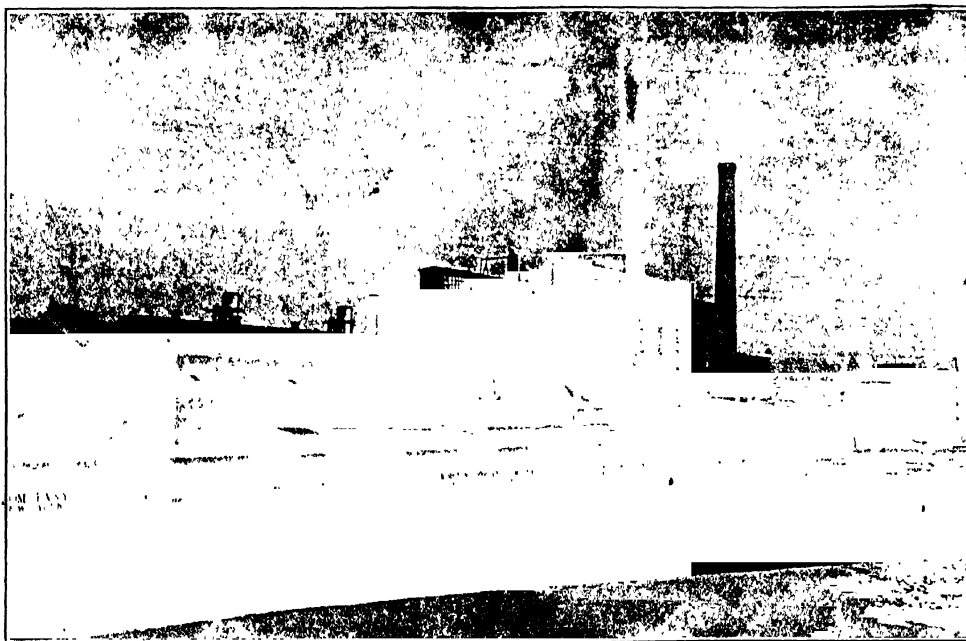
It makes weight, improves color, and blends perfectly with all standard tanning materials.

Robeson Spruce Extract is adaptable for tanning sole, heavy upper, and harness leather, as well as pigskin and other skins and hides.

It is being successfully employed by the following methods:

For sole leather: In the extract drums, tempering vats, dry dipping and in the oil wheels.

For heavy upper leather: For retanning sides and splits.



SOUTHERN PLANT, COVINGTON, VA.

# THE ROSSVILLE COMPANY

Alcohol for Every Purpose  
LAWRENCEBURG, INDIANA

New York  
Newark

Philadelphia  
Pittsburgh

STOCKS IN  
Boston  
Buffalo

Cleveland  
Detroit

Chicago  
St. Louis

## PRODUCTS

### Ethyl Alcohol

Absolute  
Cologne Spirits  
Perfumers' Spirit  
Special Grades for Special Uses  
U. S. Government Specifications  
U. S. Pharmacopeia Grade

### Denatured Alcohol

Completely Denatured  
Specially Denatured

### Fusel Oil (Amyl Alcohol)

## ETHYL ALCOHOL

We produce all the standard grades of Ethyl Alcohol, and guarantee them to meet fully the specifications laid down. Special grades for special purposes can be prepared at short notice.

## DENATURED ALCOHOL

Our Denatured Alcohols comply in every respect with the regulations of the U. S. Bureau of Internal Revenue. We are at all times prepared to furnish alcohol either completely or specially denatured in accordance with any of the permitted formulas.

## FUSEL OIL

All grades: Crude Fusel Oil, Refined Fusel Oil, Amyl Alcohol.

## MANUFACTURING FACILITIES

Our plant is thoroughly modern in all respects. The equipment and personnel are efficient and well organized, insuring uniformity of products as well as quality production. The capacity is such that quantity production can be always maintained.

## STOCKS

Ample stocks of all of our products are at all times

maintained at our works at Lawrenceburg, Ind., as well as at Boston, Buffalo, Chicago, Cleveland, Detroit, Newark, New York, Philadelphia, Pittsburgh, and St. Louis. Prompt shipments will be made from the nearest warehouse.

## CONTAINERS

We ship in clean wooden barrels and steel drums of either fifty-five or one hundred and ten gallon capacity. Tank-car shipments of from 5,000 to 10,000 gallons can also be taken care of.

## RESEARCH

The Rossville Research Laboratory is an integral part of our organization. Its facilities to the fullest extent and in all respects are at the disposal of our customers.

## SERVICE

Our Legal and Engineering Staffs are fully prepared to interpret the government regulations, to assist in the preparation of necessary permits, advise as to the proper grade of Alcohol required for any specific use, and to render any other assistance required.

## QUALITY

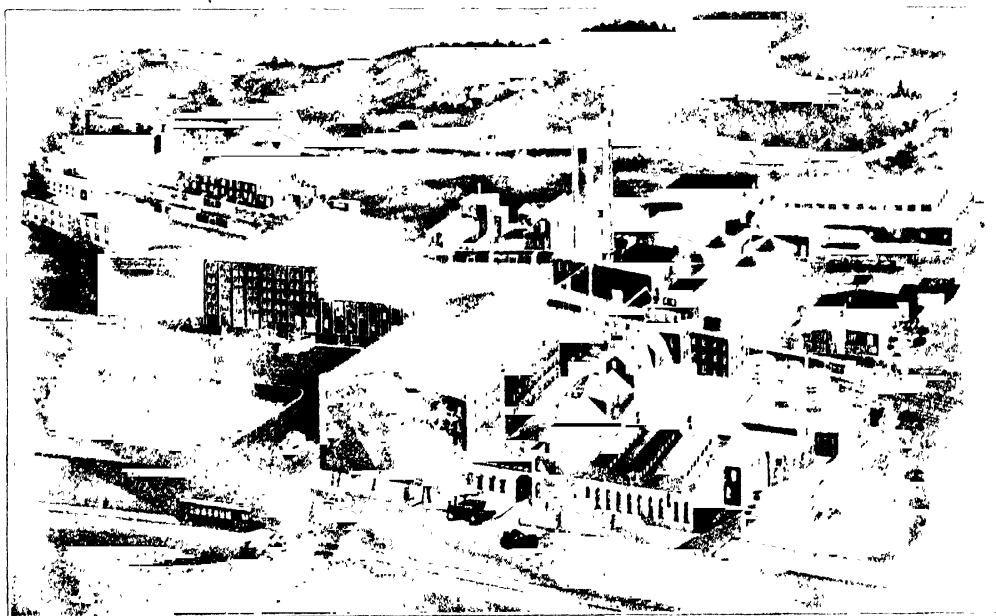
We have set as our standard the highest possible quality that can be produced. This will be constantly maintained for all of our products in every shipment.

## USES

We are prepared to do our part in the development of an All-American chemical industry. All of our facilities, knowledge and experience is available for the development of existing or new uses of any of our products.

## INQUIRIES

All inquiries should be addressed to our general offices at Lawrenceburg, Indiana.



THE ROSSVILLE COMPANY, LAWRENCEBURG, IND.

# THE ROESSLER & HASSLACHER CHEMICAL COMPANY

Manufacturing Chemists and Manufacturers' Agents

709-717 SIXTH AVENUE, NEW YORK, N. Y.



## SALES OFFICES

Boston, 40 Central Street  
Chicago, 549 E. Illinois Street  
Cincinnati, 518 Union Central Bldg

Philadelphia, 869 Drexel Bldg  
Pittsburgh, 307 Fulton Bldg  
San Francisco, 625 Market Street

Cleveland, 1740 E. 12th Street  
Kansas City, 2618 Guinotte Ave  
New Orleans, 613 Canal Bank Bldg.

## WORKS

Perth Amboy, N. J.

St. Albans, W. Va.

Niagara Electro Chemical Co., Niagara Falls, N. Y.

Pacific R. & H. Chemical Corp., Los Angeles, Cal.

Cable Address: "JIGDA", New York



## PRODUCTS

Chemicals for the Industries and Arts, particularly for Electroplating, the Tanning and Textile Industries. Solvents, Peroxides, Perborates, Pharmaceuticals, and Chlorinated Hydrocarbons.

### Electroplating Chemicals

Cyanegg (96-98% Sodium cyanide)

#### Cyanides

Copper	Silver
Lead	Zinc
Nickel	

#### "Trisalyts"

Cadmium	Silver
Copper	Zinc
Gold	

Nickel Chloride

Nickel Salts

Single (Nickel sulfate)

Double (Nickel-ammonium sulfate)

Platinum Salts

Platinum Chloride

"Platin-Nig"

Polysulfide (of soda)

Sodium Sulfoeyanide

### Ceramic Materials

For pottery, glass, clay and enameled-ware industries

Ceramic Chemicals, Minerals and Oxides

#### Chemicals

Arsenic, White	Leukonin
Barytes	Potassium Carbonate
Boric Acid	Potassium Nitrate
Borax	Powdered Blue
Cadmium, Metal	Selenium
Cadmium Sulfide	Sodium Carbonate
Cobalt Salts	Sodium Nitrate
Glass, Powdered	"Terrar"
Lead, White and Red	

#### Minerals

Antimony, Needle	Kalkspar
Clays	Cryolite
Feldspar	Marble dust
Flint	Rutile
Fluorspar	Whiting

#### Oxides

Aluminum	Manganese
Antimony	Nickel
Chromium	Tin
Cobalt	Uranium
Copper	Zinc
Iron	Zirconium
Lead	

Ceramic Decorations

Liquid Bright Gold, Silver and Platinum preparations.

#### Colors

Overglaze colors	Majolica colors
Underglaze colors	Liquid luster colors
Glass colors	Fluxes

Enamels

### Rare Metals

Platinum	Palladium
Iridium	
Other Platinum group metals	

### Solvents, Cleaners, etc.

Chloroform, U.S.P.	Acetone, U.S.P. and tech
Methanol	Methyl Acetone

### Non-inflammable Solvents

Carbon Tetrachloride	
Chlorine Derivatives	
Tetrachloroethane	Trichloroethylene
Pentachloroethane	Perchloroethylene
Dichloroethylene	

### Fumigators, Germicides, Fungicides

Formaldehyde Paste,  
Formaldehyde solution (40% volume)  
Paraformaldehyde

### Insecticides

For flour-mills, green-houses, citrus trees, etc.  
Cyanegg (96-98% Sodium cyanide)  
"Hydro-Cy" (Hydrocyanic acid, Liquid)  
Naphthalene (Moth repellant)

### Bleaching Agents

"Albone" (25 to 30% by volume H<sub>2</sub>O<sub>2</sub>)  
Bleaching Powder (Chloride of Lime)  
"Solozone" (Sodium Peroxide)  
Chlorine (liquid)  
Potassium Permanganate  
Hydrogen Peroxide  
Sodium Perborate

### Oxidizing Agents

(See also Bleaching Agents)  
Manganese Dioxide "Oxone"  
Potassium Chlorate Sodium Chlorate

### Dyeing Chemicals, etc.

Sodium Acetate	Sodium Bichromate
Sodium Phosphate	Sodium Prussiate, Yellow
Antimony Salts (65%)	Potassium Bichromate
(Tartar Emetic substitute)	Potassium Prussiate, Red
Aluminum Sulfate	and Yellow
Glauber's Salt, Anhydrous,	Formic Acid (90%)
Calcined and Crystals	Vanadium Oxide and Salts.

### Refrigeration Compounds

Ammonia, Anhydrous	Ammonia, Aqua
Methyl Chloride	Ethyl Chloride
Calcium Chloride	Sulfur Dioxide

### Tanning Chemicals

Arsenic, Red	Sodium Sulfide
Chrome Alum	Sodium Bichromate
Lactic Acid	Potassium Bichromate
	Splate (Barium chloride)

Continued on Next Page

**Rubber Chemicals****Pigments**

Antimony Sulfuret	Sulfur
Golden, Crimson,	Iron Oxides
Vermilion	Magnesium Carbonate (light)
Alumina Earth	Whiting
Magnesia (heavy)	Zinc Oxide

**Accelerators**

Hexamethylenetetramine	Formaldehyde Aniline
Technical	Thiocarbamide
Aldehyde Ammonia	

**Paint and Color Chemicals**

Antimony Sulfate	Iron Oxide
Arsenic, White	Potassium Prussiate
Barium Chloride	Sodium Prussiate
Copperas	Zinc Oxide
Copper Cyanide (Marine anti-fouling paint)	
Zinc Cyanide (Anti-rust paint)	
Whiting	

**Fireworks Chemicals**

Barium and Strontium Nitrates, Antimony Needle
Sodium Chlorate, Potassium Chlorate

**Soap-making Chemicals**

Potash, Caustic	Potassium Carbonate
Soda, Caustic	Sodium Carbonate
Stearic Acid	

**Hydrogenation Chemicals**

Nickel Formate	Nickel Oxide
Formic Acid	"Hydrene"

**Pharmaceuticals, U.S.P.**

(See also Bleaching and Oxidizing Agents)

**Peroxides**

Calcium	Strontium
Magnesium	Zinc, etc
Zinc Peroxide Soap	

**Perborates**

Calcium	Strontium
Magnesium	Zinc, etc

Acetamide, Crystal and Powder

Chloroform

Caffeine

Epsom Salt

Hexamethylenetetramine

Iron (by Hydrogen)

Lithium Salts,

Benzoate, Carbonate, Citrate, etc

**Other Chemicals for the Industries and Arts**

- Acid, Phosphoric, U.S.P. and Tech. (For soft drinks)
- Acid, Oxalic (For bleaching, dyeing and tanning)
- Iron Chlorides (For dyeing, chlorination of ores, oxidizing and pharmaceuticals)
- R. & H. Case-hardener (For tempering steel)
- Sodium Carbonate, Potassium Carbonate (Calcined and hydrated)
- (For dyeing, bleaching, soap and glass manufacturing, and tanning)
- Sal. Ammoniac, White and Gray (For galvanizing and primary cells)
- Sodium, Metallic (As reducing agent)
- Sodium Sulfite
- "Hydrene" (For generating hydrogen gas)
- Lead Acetate (For desulfurizing)
- Manganese Sulfate (For dyeing, in ceramics, and as drier)
- Potassium Oxalate and Bioxalate
- Sodium Bisulfite (For paper manufacturing and dyeing)
- Trisodium Phosphate (As boiler-compound and water-softener)
- Zinc, Sheets, Discs and Dust. (For precipitation of gold and silver in cyanide process)
- Zinc Chloride (For preservation of wood and animal material; dyeing; fire-proofing, etc.)
- Zinc Sulfate (For dyeing, as disinfectant, astringent and drier).

**SODIUM CYANIDE**

**History and Use**—Originally Cyanide was used principally for electroplating, photography, and as an aid in the amalgamation process for the recovery of precious metals from ores. The consumption in the United States was not more than several hundred tons annually. With the introduction of the MacArthur-Forrest extraction process in the Transvaal in 1891, for the recovery of gold from tailings by the use of dilute cyanide solutions, now also applied to silver sulfide ores, the world's consumption of Cyanide has increased to many thousand tons per annum. It is estimated that 25% of the world's production of gold is now extracted with cyanide.

In 1890 The Roessler & Hasslacher Chemical Company began to manufacture Potassium Cyanide at its works, Perth Amboy, N. J. Potassium Cyanide 98-99% KCN was first made by the old method of fusing Potassium Ferrocyanide; later Cyanide with addition of Sodium was made guaranteed to test equivalent to 98-99% KCN.

In 1902 the manufacture of synthetic Sodium Cyanide by the Castner process was taken up to replace the more expensive Potash Salts. At first a product of only 90% purity was obtained which has now been improved to the standard of 96-98% NaCN.

In 1916 the old method of designating the Sodium Cyanide in terms of Potassium Cyanide was dropped, though this designation of KCN equivalent to 128-130% still prevails in foreign countries. The present designation based on Sodium Cyanide content in comparison with the old method follows:

**COMPARATIVE CYANIDE VALUES**

(Theoretical)

	NaCN (100%)		KCN (100%)
Cyanogen (CN)	53.075%	Cyanogen (CN)	39.959%
Sodium (Na)	46.925%	Potassium (K)	60.047%
	100.00%		100.00%
1 lb. NaCN = 1 1/3 lbs. KCN		1 lb. KCN = 3/4 lb. NaCN	

Old Designation	Cyanogen Content for both	New Designation
Sodium Cyanide... 128-130%	51-52%	Sodium Cyanide... 96-98%
Cyanide Chloride Mixture... 98-99%	39-40%	Cyanide Chloride Mixture... 73-76%

The Roessler & Hasslacher Chemical Company is today the only manufacturer of Sodium Cyanide in the United States, to-wit:

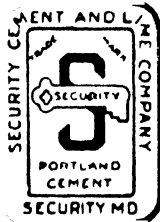
**Cyanegg** Standard high grade Sodium Cyanide 96-98% NaCN with 51-52% cyanogen content. This is a clean white salt, cast in the shape of eggs, weighing uniformly about an ounce. It is packed in air-tight galvanized iron drums, holding net 100 and 200 lbs. (gross weight 110 and 220 lbs., respectively).

**Cyanogran** 96-98% NaCN with 51-52% cyanogen content, in granular form.

**Cyanide-Chloride Mixture** 73-76% NaCN with 39-40% cyanogen content, equivalent to 98-100% KCN.

**Applicability**—The Cyanide process is especially applicable to low-grade gold ores in which the gold occurs in a finely divided free or metallic state, or refractory ores to which the amalgamation process is not applicable, and to the more common, chloride and sub-sulfide, silver ores.

# SECURITY CEMENT AND LIME COMPANY



CEMENT PLANT  
SECURITY, MD.

Western Maryland and  
Baltimore & Ohio Railroads

GENERAL OFFICES  
HAGERSTOWN, MARYLAND

## SALES OFFICES

Equitable Bldg.  
BALTIMORE, MD.

Colorado Bldg.  
WASHINGTON, D. C.



LIME PLANT  
BERKELEY, W. VA.

Cumberland Valley (Penn.) and  
Baltimore & Ohio Railroads

## PRODUCTS

**Berkeley Lump, Ground and Hydrated Lime.**  
**Security Portland Cement.**  
**Pulverized Limestone, Crushed Stone, Flux Stone.**

### BERKELEY LUMP LIME

Prepared from pure, high-calcium limestone of exceptional grade, evenly and thoroughly burned in modern, gas-fired kilns. High causticity, low silica content, free from impurities and without core.

### BERKELEY GROUND LIME

Fresh burned lime, ground to special sizes; particularly adapted to, and processed for Glass manufacturers. We specialize in 10- and 20-mesh Ground Lime. Shipped in bulk; or in 80-pound paper bags.

### SECURITY PORTLAND CEMENT

Standard Product used extensively for 13 years. Annual capacity one million barrels.

### PULVERIZED LIMESTONE

For agricultural purposes, as filler in asphalt paving and mixed fertilizer. Three grades of fineness—50%, 65% and 85% through 100-mesh sieve.

### BERKELEY HYDRATED LIME

Pure, high-calcium Lime, scientifically hydrated at kiln. Air separated and free from coarse particles, impurities, core and over-burnt Lime; practically 99% will pass a 100-mesh sieve. Tanneries, Paper and Pulp Mills, especially Soda Pulp, and many Chemical plants have substituted Berkeley Hydrated Lime for the older lump limes with marked satisfaction and economy.

### CRUSHED STONE

All sizes for Ballast and Concrete road making.

### FLUX STONE

Pure, high-calcium Limestone for fluxing purposes.

## SERVICE

Every man in our organization is trained in the knowledge that quick shipments and dependable deliveries are vital factors in the industries we serve. Our location on two trunk lines means an adequate car supply with quick rail movement to the Middle Atlantic and Southern States. Rigid chemical control insures constant maintenance of quality—a guarantee to our customers of absolutely trustworthy service.



VIEW SHOWS LIME PLANT AT BERKELEY, W. VA.





# E. M. SERGEANT COMPANY

Established Over 40 Years

15 East 26th Street  
NEW YORK, N. Y.

Cable Address  
"SERGEANTEM", New York

## PRODUCTS

The Chemicals listed below are but a partial list of those in which we specialize, due quite naturally to restricted space. We, therefore, solicit inquiries on all Chemicals.

**Soda Ash**

**Caustic Soda, 76%**

Solid, ground and flake

**Bleaching Powder**

**Glauber's Salt**

**Sal Soda**

**Acetic Acid**

**Carbbonate of Magnesia**

In 50-lb. paper lined bags

60-lb. bbls. and 30-lb. kegs

**Crystal Copperas**

In bulk, bags and bbls.

Product of the Indiana Steel & Wire Company, Muncie, Ind., whose output we control. The quality is very clean and contains a low percentage of moisture.

**Bichromate of Soda**

**Bichromate of Potash**

**Common Fine Salt**

In carloads

**Naphthalene**

Crude, crystal, flake, balls and tablets

**English China Clay**

**Talc**

Imported and Domestic

**Oxalic Acid**

**Barium Chloride**

**Olive Oil Foots**

**Red Oil**

**Bisulphite of Soda**

Powdered and Liquid

**Hyposulphite of Soda**

Regular and Pea Crystals

**Yellow Prussiate of Soda**

**Yellow Prussiate of Potash**

**Acid Citric**

**Acid Cresylic**

**Acid Tartaric**

**Alum, Ammonia and Potash**

**Aqua Ammonia**

**Aniline Oil**

**Aniline Salt**

**White Arsenic**

**Blue Vitriol**

**Cutch**

**Gambier**

**Formaldehyde**

**Blood Albumen**

**Acetate of Lead**

White and brown

**Potash Chlorate**

**Potash Permanganate**

**Creosote**

In tank steamers

**Soda Chlorate**

**Soda Sulphide**

60, 62% broken and fused

**Sumac**

Sicilian

**Wood Pulp**

Importers and in some cases sole selling agents for Scandinavian manufacturers.

**Cork Waste and Cork Wood**

A representative in Spain keeps constantly in touch with us regarding market conditions and personally inspects every shipment as to quality and weight and all other important details.

## STOCK

For the convenience of customers we keep a stock of some of these products in Warehouses in Philadelphia, Pa., Syracuse, N. Y., Paterson, N. J., Hoboken, N. J., Brooklyn and New York, thus enabling us to give prompt service and to reduce freight expense to the consumer.

## INQUIRIES

We invite inquiries from consumers who are particular about their sources of supply and the standing of houses with whom they deal. Each inquiry has the personal attention of an officer of the Company.

## CATALOG

Our catalog gives a complete list of the products handled by us. Write for it.



# SEMET-SOLVAY COMPANY

## Coal Distillates and Allied Synthetic Chemicals

Engineers and Builders of By-Product Coke-Ovens, By-Product Apparatus, and Direct Sulphate Plants

GENERAL SALES OFFICES

SYRACUSE, N. Y.

BRANCH OFFICES

CHICAGO, ILL.

NEW YORK, N. Y.

BOSTON, MASS.



### PRODUCTS

Coal distillates and allied synthetic chemicals manufactured in the Solvay Plants from the Company's own raw material starting with the mining of the coal. Thus the Company controls the character of the material entering each process which, combined with careful supervision throughout by a skilled technical staff, assures Solvay customers of quality, plus service.

### SERVICES

Engineers and Builders of By-Product Coke-Ovens  
By-Product Apparatus  
Direct Sulphate Plants

### COKE

Furnace  
Foundry  
Domestic  
Breeze

### AMMONIA PRODUCTS, ETC.

Crude Liquor  
Aqua Ammonia  
Ammonium Sulphate  
Ammonium Bicarbonate  
Ammonium Chloride  
Sodium Nitrite

### LIGHT OIL PRODUCTS

Crude Light Oil  
90% Benzol  
Pure Benzol  
Motor Benzol  
Pure Toluol  
Solvent Naphtha

### TOLUOL DERIVATIVES

Benzyl Chloride  
Benzyldehyde  
Benzoic Acid  
Sodium Benzoate

### GAS

City Lighting  
Glass Furnaces  
Open-Hearth Furnaces  
Steam Boilers

### TAR PRODUCTS

Coal-Tar  
Naphthalene  
Protective Paints for Iron and Steel  
Concrete Coatings

### BENZOL DERIVATIVES

Phenol, Synthetic  
Salicylic Acid  
Methyl Salicylate  
Picric Acid

### CYANIDE PRODUCTS

Yellow Prussiate of Soda

### THE SEMET-SOLVAY COMPANY

The Semet-Solvay Company was organized in 1895 to manufacture coke and other products from the distillation of coal and to carry on the business which was started in this country in 1892 when The Solvay Process Company brought over from Europe the first plant of by-product coke ovens erected in this country.

From these twelve small ovens, which had a capacity for coking about 50 tons of coal per day, has grown an industry which is now recognized as one of the great agencies in the conservation of our national resources.

The Semet-Solvay Company is the largest individual producer in the world of the products from the distillation of coal, and is now operating plants at:

Ashland, Kentucky	Dunbar, Pennsylvania
Benwood, West Virginia	Ensley, Alabama
Birmingham, Alabama	Holt, Alabama
Buffalo, New York	Indianapolis, Indiana
Chattanooga, Tennessee	Ironton, Ohio
Chicago, Illinois	Navarre, Michigan
Cleveland, Ohio	Portsmouth, Ohio
Detroit, Michigan	Syracuse, New York

These plants are making a notable contribution towards remedying a discreditable waste of the nation's riches. Only six years ago the United States Geological Survey estimated this waste at \$80,000,000 annually.

### PROGRESS

The first by-product ovens were brought to America primarily for the purpose of producing ammonia for the manufacture of soda by the Solvay process. The Semet-Solvay Company has been closely associated with the Solvay Process Company ever since its incorporation, and has co-operated with it in the development of the chemical industries of the country.

The processes employed in the distillation of coal have developed remarkably in America since the early days, and in some respects are now distinctly in advance of European methods, especially in the size of units and speed of operation. The retort ovens originally brought to this country had a capacity for carbonizing less than 4½ tons of coal per day, while a modern unit can readily carbonize 20 tons of coal per day, with no more labor.

*Continued on Next Page*

## OPERATIONS

The Company produces a large percentage of the coal used in its plants from its own mines, sixteen in number, located mainly in West Virginia and Kentucky, and is the only commercial company in America which carries on the entire operation from the mining of the coal through to the production for sale of the finished products ready for the chemical trade.

Coincident with the growth of this Company have grown the chemical industries of America. The demand for the chemical products obtained in the distillation of coal has developed with the available supply.

For many years this Company was the only producer on an important scale in America of benzol, toluol, xylol and solvent naphtha, which have come into prominent notice of late, as they are the raw materials from which we make many of the high explosives which played such an important part in the great war.

Seventeen years ago the Company began the production from its benzol of synthetic carboic acid in large quantities and of the highest purity, mainly for conversion into picric acid and ammonium picrate. Since then the Company's chemical products from the distillation of coal have grown to number about 35 articles, as shown in the list given above.

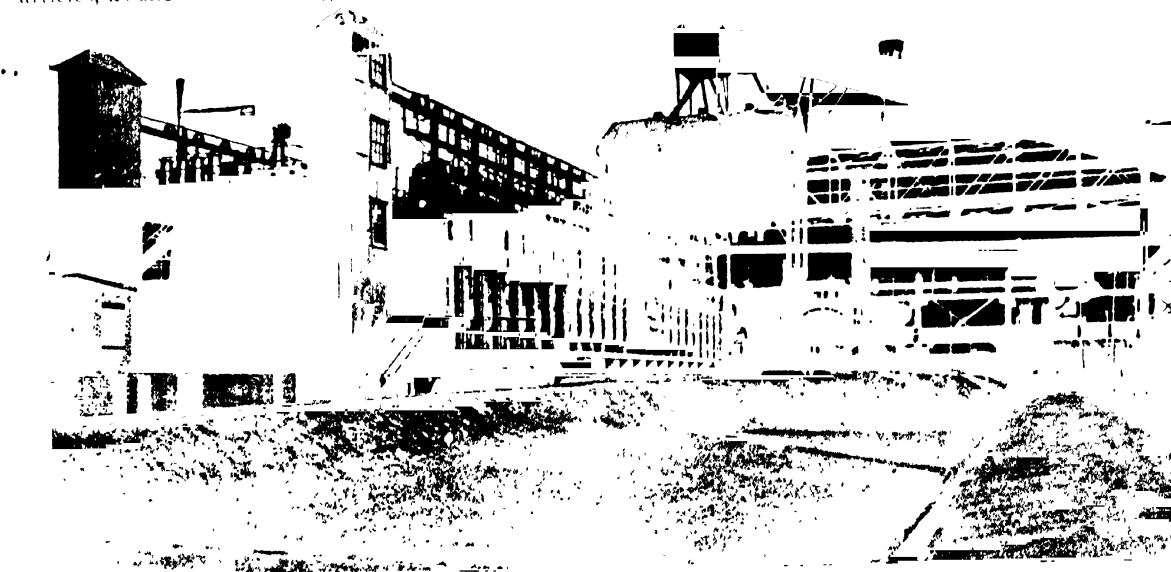
In addition to this, the Company has recently associated itself with the National Aniline & Chemical Company, Incorporated, thereby entering the great field of colors and dyes, which war conditions have shown to play a vital part in the industrial life of a nation. The finished products of the Semet-Solvay Company form the raw materials for the manufacture of these colors and dyes. Therefore, this association forms the connecting link for the production of the most highly finished industrial products all the way up from the raw coal in the ground.

## RELIABILITY

For nearly 25 years the Company's constant aim has been to make the name "Solvay" stand for reliability and the highest possible quality of everything put out under its name. The Company's policy has always been that the best advertising is the satisfied customer, and to this end the Company's experts have made themselves familiar with the use to which its products are put, so that each article can be produced of the best quality and in the best form for the purpose required.

## CORRESPONDENCE SOLICITED

The Company welcomes correspondence regarding any of its products and will gladly cooperate in suiting them to the needs of its customers. We want you to become acquainted with "Solvay Service." When you need any products from the distillation of coal, insist on those made under the Solvay name and become one of Solvay's satisfied customers.



SEMET-SOLVAY PLANT OF THE CHATTANOOGA (TENN.) COKE AND GAS CO.

# THE SHEPHERD CHEMICAL CO.

CINCINNATI, OHIO

EASTERN REPRESENTATIVES

STOAN & RUSSELL, INC.

198 Broadway

New York, N. Y.

WORKS

Norwood, Ohio

## PRODUCTS

**Cobalt Salts**

**Driers for Inks, Paints and Varnishes**

**Lead Peroxide**

**Manganese Peroxide**

**Metallic Soaps**

**Chrome Green Oxide**

## COBALT SALTS

We are headquarters for all Cobalt salts and manufacturers of cobalt pigments, glass, ceramic products, varnish driers, etc., may be sure of obtaining high grade products best suited to their particular purposes.

Acetate

Arsenate

Carbonate

Chloride

Hydrate

Nitrate

Oxalate

Phosphate

Sulphate

## DRIERS FOR INKS, PAINTS AND VARNISHES

Aluminum Resinate

Cobalt Acetate

Cobalt Hydrate

Cobalt Ink Drier No. 354

Cobalt Linoleate, Solid

Cobalt Linoleate, Paste

Cobalt Linoleate, Liquid

Cobalt Resinate, Precipitated

Cobalt Resinate, Fused

Cobalt Special Ink Paste

Cobalt Japan Drier

Copper Linoleate

Copper Resinate

Hardening Powder

Japan Driers

Lead Linoleate

Lead Resinate, Precipitated

Lead Resinate, Fused

Manganese Acetate

Manganese Borate

Manganese Linoleate

Manganese Resinate, Precipitated

Manganese Resinate, Fused

Manganese Dioxide, Ground

Manganese Dioxide, Recovered

Zinc Resinate, Precipitated

Zinc Resinate, Fused

## LEAD PEROXIDE

## MANGANESE PEROXIDE

We produce these peroxides in both powder and paste form. Color manufacturers will find these products of the highest quality and extremely reactive. \*\*

## CHROME GREEN OXIDE

Of highest purity for use in the ceramic industry.

## METALLIC SOAPS

Aluminum Oleate

Aluminum Palmitate

Aluminum Stearate

Calcium Stearate

Lead Oleate

Lead Palmitate

Lead Stearate

Iron Oleate

Other Metallic Oleates, Palmitates and Stearates.

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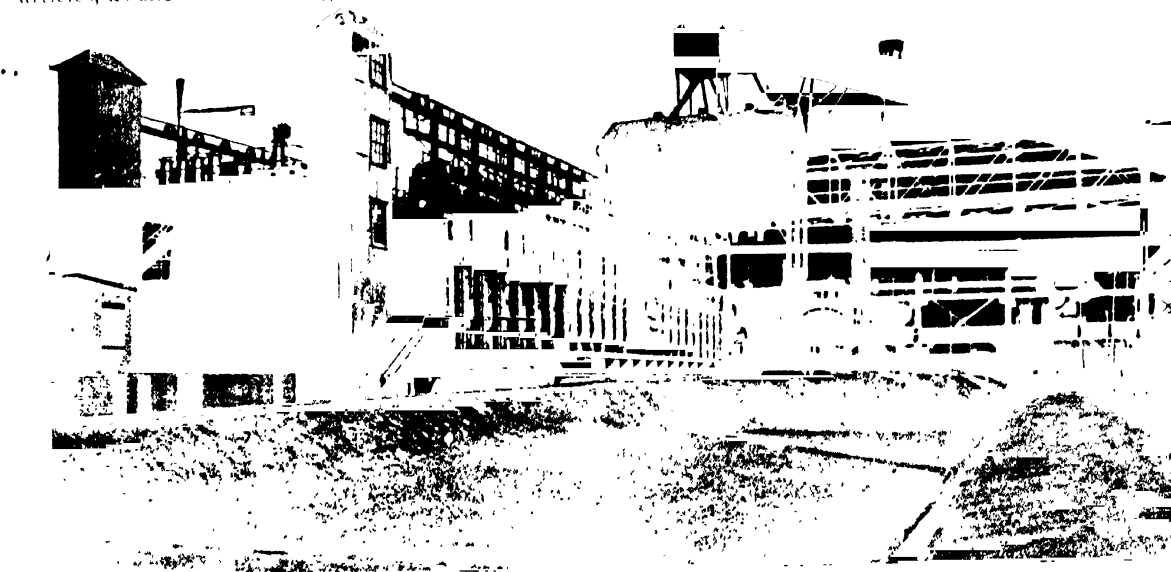
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SEMET-SOLVAY PLANT OF THE CHATTANOOGA (TENN.) COKE AND GAS CO.

# THE SOLVAY PROCESS COMPANY

Manufacturer of Alkalis



Detroit Mich

SYRACUSE, N. Y.

Hutchinson Kan

SOLE AGENTS

WING & EVANS, INC.

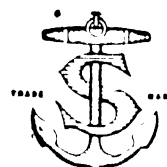
22 William Street, New York, N. Y.

BRANCH OFFICES

Detroit Mich  
625 Book Building

Boston Mass  
49 State Street

Chicago Ill  
10 N. Dearborn St



## PRODUCTS

The Sodium Alkalis in all Commercial Tests and Allied Products.

Soda Ash, dense and ordinary.

Caustic Soda, solid, granular and flake.

Bicarbonate of Soda.

Caustic Ash, 15%, 25%, 36%, 45%.

Modified Soda, so called Neutral Soda.

Snow Flake Crystals, sodium sesquicarbonate.

Crown Filler, paper filler.

Limestone, commercial and agricultural.

Calcium Chloride, solid, granular and flake.

Whiting.

Metal Cleaner, grease remover.

## PLANTS

The three plants of The Solvay Process Company are located at points of advantage for the distribution of their products. They are also located near suitable supplies of raw materials.

The Syracuse plant has ample capacity and an ideal location to supply the eastern part of the United States.

The Detroit plant can care for the middle west both as to capacity and distribution facilities.

The rapidly developing west and southwest are adequately provided for at the Hutchinson plant.

Each of these plants is thoroughly modern. Uniform methods of control and operation are maintained at all plants. The general operating and technical staffs at Syracuse working through the local plants staffs insure uniform operation and uniform products.

Rigid specifications for all products based on the consumers' needs are in force. All products are inspected and passed on by the laboratories before shipment.

## TECHNICAL SERVICE

A staff of trained chemists is maintained to promote the best use of the company's products and to sense the needs of the trade as regards quality or form of alkali demanded.

This Department is available to the consumer for information in regard to the composition, properties and uses of alkalis. It is also available for problems connected with the use of alkali in manufacturing, bleaching, cleansing, water softening, etc., or for analytical service. The Solvay Process Company recommends the purchase of alkali on specifications.

## SODA ASH— $\text{Na}_2\text{CO}_3$

Soda Ash is found in commerce in the following grades, all of which are made by The Solvay Process Company.

58% Light and 58% Dense

48% Light and 48% Special

The 58% Ash is the highest grade of Soda Ash manufactured and contains not less than 98.8% sodium carbonate on leaving the plant or 99.17% on a dry sample, not more than 55% salt, and not over .1% insoluble. It is white in color and is of medium fineness.

The distinction between 58% Light (or ordinary) and 58% Dense is merely one of density, the Dense Ash weighing about twice as much as the Ordinary Ash per unit volume.



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PLANT OF THE SOLVAY PROCESS CO., SYRACUSE, N. Y.

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One liter of 58% Light Ash weighs about 500 grams while one liter of 58% Dense Ash weighs not less than 950 grams.

Chemically they are identical and perform the same functions. The Dense Ash is used where small bulk is desirable, e.g., in glass manufacture.

The 48% Ordinary Ash and the 48% Special are reduced with salt (NaCl) and sodium sulphate (Na<sub>2</sub>SO<sub>4</sub>) respectively. Both of these grades contain about 82% sodium carbonate and about 17% salt in the case of the Ordinary and 17% sodium sulphate in the case of the Special. They are used for special purposes where a milder form of soda ash is desired.

Soda Ash is used in the manufacture of glass, soap, paper, chemicals, drugs, paints, leather, enamel ware, cleansers. It is also used in the textile industries, in dyeing operations, bleaching, water softening, metallurgical operations, bottle and dish washing, refining of vegetable and mineral oils, metal working and prevention of timber mold.

#### Packages: Soda Ash

58% Light Soda Ash	Bags	300 lbs.	Barrels	300 lbs.
58% Dense "	Bags	500 "		500 "
48% Ordinary "	Bags	300 "		300 "
48% Special "	Bags	500 "		

#### BICARBONATE OF SODA NaHCO<sub>3</sub>

Bicarbonate of Soda in the pure, white, fine form is the well known Baking Soda. It contains not less than 99.7% sodium bicarbonate, not over .025% —.03% salt and not more than .004 gram per kilo. of iron (Fe<sub>2</sub>O<sub>3</sub>).

It is used in the manufacture of baking powders, which are used over the civilized world. Also, other grades not so highly refined are used for producing carbonic acid for charging waters, in the manufacture of chemicals and drugs, for charging fire extinguishers, and for the prevention of timber mold.

#### Packages: Bicarbonate of Soda

Barrels 350 to 550 lbs. net, according to grade.

#### CAUSTIC SODA—NaOH

Caustic Soda is manufactured in the following grades:

##### SOLID CAUSTIC—

76%, 74%, 70% Ordinary  
70% Special, 60% Ordinary  
60% Special

##### GROUND CAUSTIC—

76%, 74%

##### FLAKE CAUSTIC—76%

Caustic Soda is graded according to the percentage content of actual alkali (Na<sub>2</sub>O) in it, 76% being the highest commercial grade.



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76% Caustic Soda contains at least 97% sodium hydrate (NaOH), less than 1% sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>) and less than .75% sodium sulphate (Na<sub>2</sub>SO<sub>4</sub>).

74% Caustic Soda contains about 94% sodium hydrate (NaOH), approximately 1.5% sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>), 1.3% sodium sulphate (Na<sub>2</sub>SO<sub>4</sub>) and 2% salt.

70% Ordinary and 70% Special both contain about 90% sodium hydrate (NaOH), 1%–1.5% sodium carbonate, and about 7% salt for the former and 7% sodium sulphate for the latter.

60% Ordinary and 60% Special both contain about 77% sodium hydrate (NaOH), 1%–1.5% sodium carbonate, and about 20% salt for the former and 20% sodium sulphate for the latter.

The chief uses of Caustic Soda are in the manufacture of soap, paper, lye, chemicals, drugs, and dyes, paints, enamel ware, leather, used also in the textile industries, mercerizing of cotton, manufacture of artificial silk, water softening, bottle washing, vegetable and mineral oil refining, metal working, and in the preparation of cleansers.

The Special Caustic Sodas contain amounts of sodium carbonate and sodium sulphate, and are of a softer nature than the ordinary Caustic.

#### Packages:

Caustic Soda—Solid—Drums 675 lbs. net.

**Ground Caustic** is ordinary solid caustic ground for putting up in small packages, for use in cleansing, in batteries, etc.

#### Packages:

Ground—Barrels 550 lbs. 575 lbs.; Drums 400 lbs.

**Flaked Caustic**—As indicated by its name, flaked Caustic Soda is a product prepared in thin wafer or flake-like form, suitable for all purposes for which ground caustic is used, but possessing physical properties which make it more desirable for handling, and gives it a better appearance.

It is free from dust, which makes it less hygroscopic than ground caustic, and consequently the material is much less likely than the ground caustic to cake when stored. It is furnished only as high test 76% caustic.

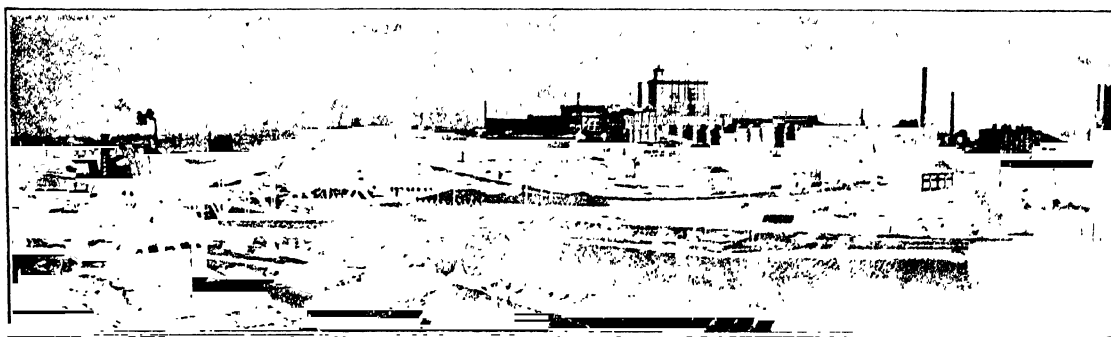
Packages—Drums 375 lbs. net.

#### CAUSTIC ASH

Caustic Ash is a term covering intimate and finely ground mixtures of Soda Ash and Caustic Soda, and is usually graded ac-



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according to the percentage content of Caustic Soda, i.e., actual sodium hydroxide (NaOH).

We are prepared to make any mixture desired, and have the following grades always in stock:

Caustic Ash of 15%, 25%, 36%, 45% NaOH  
 15% Caustic Ash contains not less than 15% caustic soda and about 84% sodium carbonate  
 25% Caustic Ash contains not less than 25% caustic soda and about 74% sodium carbonate  
 36% Caustic Ash contains not less than 36% caustic soda and about 62% sodium carbonate  
 45% Caustic Ash contains not less than 45% caustic soda and about 53% sodium carbonate

Caustic Ash is used in many cleansing operations where a strong alkali is needed, as in boiling of cotton, bottle washing and metal cleaning, etc. It is also used for water softening and in the manufacture of leather.

See Special Pamphlets on Metal Cleaning and Water Purification.

#### MODIFIED SODAS (so-called Neutral Sodas)

Modified Sodas is a term which includes those forms of mild alkali which contain more carbonic acid than the normal sodium carbonate or Soda Ash and less than bicarbonate of soda. These products are sometimes known as "neutral sodas."

The Solvay Process Company manufactures the following specialties in Modified Sodas and is prepared to furnish any other particular combination desired.

Snow Flake Crystals,  $\text{Na}_2\text{CO}_3$ ,  $\text{NaHCO}_3$ ,  $2\text{H}_2\text{O}$  are fine white needle-like crystals, which are very readily soluble in water and are absolutely free from caking in storage. This product is used principally in the textile and laundry industries.

Solvay Laundry Soda is a granular modified soda of the usual form of approximately the composition of the Snow Flake Crystals. It is designed especially for laundry use.

Solvay Special Laundry Soda is a granular soda somewhat stronger than the regular soda for use on special laundry operations where a stronger alkali is needed.

Solvay Cleansing Soda is a granular form of modified soda in two strengths X and XX for use in dairies, creameries and general cleansing operations.

#### SPECIAL PRODUCTS

Special mixtures designed for use in the leather industry are:

Tanners Soda  
 Tanners Alkali

Tanners Soda is a mild alkaline mixture prepared for use in the tanning of leather.

Tanners Alkali is a specially prepared mixture which is used in the tanning process when a stronger alkali than Tanners Soda is desired.

#### Packages

Tanners Soda—Barrels—280 lbs Net  
 Tanners Alkali—Barrels—300 lbs Net

Special compositions prepared for use in the manufacture of metal articles are:

Grade "A" Metal Cleaner  
 Grade "B" Metal Cleaner

Grade "A" Metal Cleaner is a specially prepared product which, in a hot water solution, removes oils and greases from the soft metals.

Grade "B" Metal Cleaner is a product of strong cleaning action designed for removing oils and grease from metals, unaffected by alkali, in exacting work.

#### Packages

Grade "A" Metal Cleaner—Barrels—300 lbs Net  
 Grade "B" Metal Cleaner—Barrels—300 lbs Net

#### CROWN FILLER— $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

Crown Filler is an extremely pure sulphate of lime, of a beautiful crystal form. It is the highest grade paper filler known, and is unrivaled by any other filler.

#### CALCIUM CHLORIDE— $\text{CaCl}_2$

Calcium Chloride is furnished as 75% Solid, 75% Granulated, 75% Flake, 40% Liquid and 50% Liquid.

It is used as a Refrigeration Brine, for Cold Storage, Air Drying, drying Food Products, laying of Highway Dust, Weed Killing, Prevention of Coal Mine Explosions, in Coal Washing, Tempering of Metals, in the Canning Industry, and for Non-freezing solutions.

See our Special Pamphlets on Calcium Chloride.



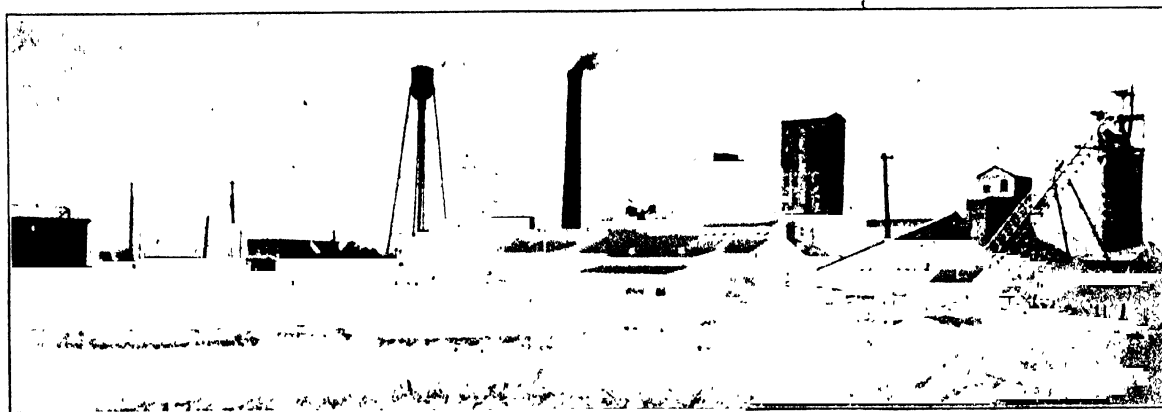
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PLANT OF THE SOLVAY PROCESS CO., HUTCHINSON, KANSAS

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**LIMESTONE—CaCO<sub>3</sub>**

At our extensive quarries of high grade limestone we have installed modern equipment for crushing, sizing and pulverizing limestone.

The crushed limestone is marketed for all concrete and road metal purposes, and is sized for those particular uses.

Solvay Pulverized Limestone for Farm Lands is ground to that degree of fineness required, and represents a superior article for farmers' use.

See our Special Pamphlet on Pulverized Limestone for Farm Lands.



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**LITERATURE**

**Blue Book**—From time to time The Solvay Process Company has published notes on the various methods of testing and valuing alkalis in use in this country and abroad.

The latest edition of the Company's Blue Book, entitled "Solvay Alkali," treats fully of the above named topic and contains much other information of interest to Alkali users. We shall be glad to send you a copy on request, made to the Technical Service Department, The Solvay Process Company, Syracuse, New York.

**Solvay Bulletins**—Every analytical chemist should receive regularly the "Solvay Bulletins" giving tested and approved methods of analysis for alkali products. We will be glad to place your name on the mailing list and send you a binder for the series.

**TABLE FOR COMPARING DIFFERENT SYSTEMS OF ALKALIMETRY FOR SODA ASH**

The following table gives the chemical and commercial equivalents for the different kinds of alkali. On the continent of Europe, alkali is sold by its strength in carbonate of soda (Na<sub>2</sub>CO<sub>3</sub>), as per column No. 1 of table. In England, alkali is sold nominally on its strength in actual alkali (Na<sub>2</sub>O), as per column No. 2 of table, but actually on the so-called "Newcastle Test" of the actual alkali, as per column No. 3 of table. In the United States, the commercial standard for 75 years has been the New York and Liverpool Test for actual alkali, as per column No. 4 of table.

No. 1	No. 2	No. 3	No. 4
Soda Ash Sodium Carbonate Na <sub>2</sub> CO <sub>3</sub> Per Cent	Actual Alkali Sodium Oxide Na <sub>2</sub> O Per Cent	Newcastle Test Sodium Oxide Na <sub>2</sub> O Per Cent	N. Y. & Liv. Sodium Oxide Na <sub>2</sub> O Per Cent
79.51	46.5	47.11	48.00
80.37	47.0	47.62	48.51
81.22	47.5	48.12	49.03
82.07	48.0	48.63	49.54
82.93	48.5	49.14	50.06
83.78	49.0	49.64	50.58
84.64	49.5	50.15	51.09
85.48	50.0	50.66	51.61
86.34	50.5	51.16	52.12
87.19	51.0	51.67	52.64
88.05	51.5	52.18	53.16
88.90	52.0	52.68	53.67
89.76	52.5	53.19	54.19
90.61	53.0	53.70	54.70
91.47	53.5	54.20	55.22
92.32	54.0	54.71	55.74
93.18	54.5	55.22	56.25
94.03	55.0	55.72	56.77
94.89	55.5	56.23	57.29
95.74	56.0	56.74	57.80
96.60	56.5	57.24	58.32
97.45	57.0	57.75	58.83
98.31	57.5	58.26	59.35
99.16	58.0	58.76	59.87
100.00	58.5	59.27	60.38

**TABLE FOR COMPARING DIFFERENT SYSTEMS OF ALKALIMETRY FOR CAUSTIC SODA**

Caustic Soda is sold on its strength in Na<sub>2</sub>O, as indicated in the New York and Liverpool Test column below.

The price is always based on 60% Caustic, with a proportionate addition for the higher percentages.

No. 1	No. 2	No. 3	No. 4
Caustic Soda Sodium Hydroxide NaOH Per Cent	Actual Alkali Sodium Oxide Na <sub>2</sub> O Per Cent	Newcastle Test Sodium Oxide Na <sub>2</sub> O Per Cent	N. Y. & Liv. Sodium Oxide Na <sub>2</sub> O Per Cent
74.83	58.0	58.76	59.87
75.48	58.5	59.37	60.48
76.12	59.0	59.97	61.09
76.77	59.5	60.58	61.42
77.40	60.0	60.79	61.93
78.05	60.5	61.30	62.45
78.70	61.0	61.80	62.97
79.35	61.5	62.31	63.48
80.00	62.0	62.82	64.00
80.65	62.5	63.32	64.52
81.29	63.0	63.83	65.04
81.94	63.5	64.34	65.55
82.58	64.0	64.84	66.06
83.23	64.5	65.35	66.58
83.87	65.0	65.85	67.10
84.52	65.5	66.36	67.61
85.16	66.0	66.87	68.13
85.81	66.5	67.37	68.65
86.45	67.0	67.88	69.16
87.10	67.5	68.39	69.68
87.74	68.0	68.89	70.19
88.39	68.5	69.40	70.71
89.03	69.0	69.91	71.23
89.67	69.5	70.41	71.74
90.30	70.0	70.92	72.26
90.95	70.5	71.43	72.77
91.60	71.0	71.93	73.29
92.25	71.5	72.44	73.81
92.90	72.0	72.95	74.32
93.55	72.5	73.45	74.84
94.19	73.0	73.96	75.35
94.84	73.5	74.47	75.87
95.48	74.0	74.97	76.39
96.13	74.5	75.48	76.90
96.77	75.0	75.99	77.42
97.42	75.5	76.49	77.94
98.06	76.0	77.00	78.45
98.71	76.5	77.51	78.97
99.35	77.0	78.01	79.49
100.00	77.5	78.52	80.00

**SUMMARY OF SHIPPING WEIGHTS OF SOLVAY PRODUCTS**  
Net Weight—Pounds

Product	Container	Gross	Net
58% Soda Ash Light	Bags 27" x 46"	30.2 lb.	29 lb.
58% Soda Ash Light	BBls.	199 lb.	300 lb.
58% Soda Ash Dense	Bags 27" x 46"	42.2 lb.	40 lb.
58% Soda Ash Dense	BBls.	472 lb.	430 lb.
58% Soda Ash Ordinary	BBls.	422 lb.	400 lb.
58% Soda Ash Ordinary	Bags 27" x 45"	41 lb.	40 lb.
Solvay Laundry Soda	BBls.	302 lb.	280 lb.
Solvay Cleansing Soda X	BBls.	302 lb.	280 lb.
Solvay Cleansing Soda XX	BBls.	302 lb.	280 lb.
Timmers Soda	BBls.	302 lb.	280 lb.
Laundry Soda Special	BBls.	302 lb.	280 lb.
Snow Flake	BBls.	302 lb.	280 lb.
Snow Flake	BBls.	302 lb.	280 lb.
Snow Flake Special	1/2 Bbl.	673 lb.	600 lb.
Snow Flake Dense	1/2 Bbl.	673 lb.	600 lb.
Snow Flake Light	BBls.	302 lb.	280 lb.
Caustic Ash 15%	BBls.	122 lb.	110 lb.
Caustic Ash 25%	BBls.	122 lb.	110 lb.
Caustic Ash 36%	BBls.	122 lb.	110 lb.
Caustic Ash 45%	BBls.	122 lb.	110 lb.
Timmers Alkali	BBls.	122 lb.	110 lb.
70% Caustic Soda, Solid (1)	11" drums	111 lb.	100 lb.
70% Caustic Soda, Solid (2)	11" drums	111 lb.	100 lb.
70% Caustic Soda, Solid (3)	11" drums	111 lb.	100 lb.
70% Caustic Soda, Solid (4)	11" drums	111 lb.	100 lb.
70% Caustic Soda, Solid (5)	11" drums	111 lb.	100 lb.
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70% Caustic Soda, Solid (83)	11" drums	111 lb.	100 lb.
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70% Caustic Soda, Solid (94)	11" drums	111 lb.	100 lb.
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70% Caustic Soda, Solid (96)	11" drums	111 lb.	100 lb.
70% Caustic Soda, Solid (97)	11" drums	111 lb.	100 lb.
70% Caustic Soda, Solid (98)	11" drums	111 lb.	100 lb.
70% Caustic Soda, Solid (99)	11" drums	111 lb.	100 lb.
70% Caustic Soda, Solid (100)	11" drums	111 lb.	100 lb.

# SMITH CHEMICAL & COLOR CO., INC.

Importers, Exporters and Manufacturers



MAIN OFFICE AND WAREHOUSE

Corner Water Street and Peck Slip  
NEW YORK, N. Y.

Cable Address  
"SMITHKEMCO", New York

Code  
ABC, 5th Edition

WORKS  
Brooklyn, N. Y.

## PRODUCTS

Chemicals for all Industrial, Scientific and Medicinal Purposes such as the manufacture of Rubber products, Pottery and Enamel Ware, Toilet Requisites, Composition Flooring, Matches and Pyrotechnics, Disinfectants and Exterminators, Bleaching of Textiles.

Dry Colors, Fillers and Lakes for Manufacturers of Rubber, Paints and Varnishes, Printing and Lithographic Inks, Wall Papers and Coverings, Leather Substitutes, Artificial Leathers, Paper and Cardboard, Linoleum and Oil-cloth, Stove, Metal, Shoe and Leather Polishes.

## ACIDS

Acetic, 56%, Commercial  
Phosphoric, U.S.P.  
Phosphoric, Technical  
Salicylic, U.S.P.  
Salicylic, Technical

## AMMONIUM

Chloride (Muriate, Sal Ammoniac)  
For Electric Batteries  
Phosphate, 98-100%  
For Fireproofing Wood

## ANILINE OIL

## ANTIMONY SULFURET

Crimson and Golden, 15 to 17% Free Sulfur  
Specially produced for Rubber Compounding

"ASBESTINE," White Pigment Filler

## BARIUM CHLORIDE

## BARYTES

White  
Off-color

## BLANC FIXE

Pulp  
Powdered

## CARBON GAS BLACK

## CARBON TETRACHLORIDE

## CHINA CLAY

Washed and Powdered

## COPPER

Carbonate, Technical  
Oxide, Red  
Sulfate, Crystals

## FACE POWDER BASE

## GLUE, RUBBER-MAKERS'

## IRON

Oxide, Red  
Sulfate (Copperas)

## LAMPBLACK

## LEAD

Acetate (Sugar of Lead)  
Nitrate

## LITHARGE

LITHOPONE, 30-50%

## MAGNESIUM

Carbonate, Commercial  
Oxide, Calcined  
Light, Medium, Heavy  
Sulfate, U.S.P. (Epsom Salt)

## NITROBENZOL (Oil of Myrbane)

## PARA-DICHLOROBENZENE

Preservation of Fruit Trees

## OILS

Citronella  
Palm-kernel

## PHENOL (Carbolic Acid)

U.S.P.  
Technical

## SODIUM

Nitrate  
Ferrocyanide (Yellow Prussiate)

## SULFUR

Flour  
Chloride, Red

## TALC, FRENCH, POWDERED

## TERRA ALBA

## WHITING

Imported and Domestic

## WOOL GREASE, NEUTRAL

## ZINC

Oxide, Lead-free  
Stearate  
Sulfate

## DRY COLORS, FILLERS AND LAKES

Blacks  
Reds  
Whites  
Blues  
Yellows  
Browns  
Greens

## QUALITY

Our policy being to render efficient service and distribute dependable merchandise at the lowest market value, we have established a reputation as Counselors and Specialists along Color and Chemical lines.

Our aim is to supply that grade of product best suited to the process of manufacture involved and the result to be attained.

## INQUIRIES

We welcome inquiries concerning our products at all times, and shall be glad to confer with users of Chemicals and Colors regarding availability of supplies, grade of product required, specifications to be met, prices, etc.

## STOCKS

We carry in stock at our New York warehouse stocks of our specialties, and of many other chemicals, and are thus able to make prompt deliveries.

**LIMESTONE—CaCO<sub>3</sub>**

At our extensive quarries of high grade limestone we have installed modern equipment for crushing, sizing and pulverizing limestone.

The crushed limestone is marketed for all concrete and road metal purposes, and is sized for those particular uses.

Solvay Pulverized Limestone for Farm Lands is ground to that degree of fineness required, and represents a superior article for farmers' use.

See our Special Pamphlet on Pulverized Limestone for Farm Lands.



**THIS LABEL ON  
EVERY PACKAGE**

**LITERATURE**

**Blue Book**—From time to time The Solvay Process Company has published notes on the various methods of testing and valuing alkalis in use in this country and abroad.

The latest edition of the Company's Blue Book, entitled "Solvay Alkali," treats fully of the above named topic and contains much other information of interest to Alkali users. We shall be glad to send you a copy on request, made to the Technical Service Department, The Solvay Process Company, Syracuse, New York.

**Solvay Bulletins**—Every analytical chemist should receive regularly the "Solvay Bulletins" giving tested and approved methods of analysis for alkali products. We will be glad to place your name on the mailing list and send you a binder for the series.

**TABLE FOR COMPARING DIFFERENT SYSTEMS OF ALKALIMETRY  
FOR SODA ASH**

The following table gives the chemical and commercial equivalents for the different kinds of alkali. On the continent of Europe, alkali is sold by its strength in carbonate of soda (Na<sub>2</sub>CO<sub>3</sub>), as per column No. 1 of table. In England, alkali is sold nominally on its strength in actual alkali (Na<sub>2</sub>O), as per column No. 2 of table, but actually on the so-called "Newcastle Test" of the actual alkali, as per column No. 3 of table. In the United States the commercial standard for 75 years has been the New York and Liverpool Test for actual alkali, as per column No. 4 of table.

No. 1	No. 2	No. 3	No. 4
Soda Ash Sodium Carbonate Na <sub>2</sub> CO <sub>3</sub> Per Cent	Actual Alkali Sodium Oxide Na <sub>2</sub> O Per Cent	Newcastle Test Sodium Oxide Na <sub>2</sub> O Per Cent	N. Y. & Liv. Sodium Oxide Na <sub>2</sub> O Per Cent
79.51	46.5	47.11	48.00
80.37	47.0	47.62	48.51
81.22	47.5	48.12	49.03
82.07	48.0	48.63	49.54
82.93	48.5	49.14	50.06
83.78	49.0	49.64	50.58
84.64	49.5	50.15	51.09
85.48	50.0	50.66	51.61
86.34	50.5	51.16	52.12
87.19	51.0	51.67	52.64
88.05	51.5	52.18	53.16
88.90	52.0	52.68	53.67
89.76	52.5	53.19	54.19
90.61	53.0	53.70	54.70
91.47	53.5	54.20	55.22
92.32	54.0	54.71	55.74
93.18	54.5	55.22	56.25
94.03	55.0	55.72	56.77
94.89	55.5	56.23	57.29
95.74	56.0	56.74	57.80
96.60	56.5	57.24	58.32
97.45	57.0	57.75	58.83
98.31	57.5	58.26	59.35
99.16	58.0	58.76	59.87
100.00	58.5	59.27	60.38

**TABLE FOR COMPARING DIFFERENT SYSTEMS OF ALKALIMETRY  
FOR CAUSTIC SODA**

Caustic Soda is sold on its strength in Na<sub>2</sub>O, as indicated in the New York and Liverpool Test column below.

The price is always based on 60% Caustic, with a proportionate addition for the higher percentages.

No. 1	No. 2	No. 3	No. 4
Caustic Soda Sodium Hydroxide NaOH Per Cent	Actual Alkali Sodium Oxide Na <sub>2</sub> O Per Cent	Newcastle Test Sodium Oxide Na <sub>2</sub> O Per Cent	N. Y. & Liv. Sodium Oxide Na <sub>2</sub> O Per Cent
74.83	58.0	58.76	59.87
75.48	58.5	59.27	60.38
76.12	59.0	59.77	60.90
76.77	59.5	60.28	61.42
77.40	60.0	60.79	61.93
78.05	60.5	61.30	62.45
78.70	61.0	61.80	62.97
79.35	61.5	62.31	63.48
80.00	62.0	62.82	64.00
80.65	62.5	63.32	64.52
81.29	63.0	63.83	65.04
81.94	63.5	64.34	65.55
82.58	64.0	64.84	66.06
83.23	64.5	65.35	66.58
83.87	65.0	65.85	67.10
84.52	65.5	66.36	67.61
85.16	66.0	66.87	68.13
85.81	66.5	67.37	68.65
86.45	67.0	67.88	69.16
87.10	67.5	68.39	69.68
87.74	68.0	68.89	70.19
88.39	68.5	69.40	70.71
89.03	69.0	69.91	71.23
89.67	69.5	70.41	71.74
90.30	70.0	70.92	72.26
90.95	70.5	71.43	72.77
91.60	71.0	71.93	73.29
92.25	71.5	72.44	73.81
92.90	72.0	72.95	74.32
93.55	72.5	73.45	74.84
94.19	73.0	73.96	75.35
94.84	73.5	74.47	75.87
95.48	74.0	74.97	76.39
96.13	74.5	75.48	76.90
96.77	75.0	75.99	77.42
97.42	75.5	76.49	77.94
98.06	76.0	77.00	78.45
98.71	76.5	77.51	78.97
99.35	77.0	78.01	79.49
100.00	77.5	78.52	80.00

**SUMMARY OF SHIPPING WEIGHTS OF SOLVAY PRODUCTS**  
Net Weight—Pounds

Product	Container	Gross	Net
58% Soda Ash Light	Bags 27" x 46"	30.2 lb.	2 lb.
58% Soda Ash Light	BBls.	192 lb.	300 lb.
58% Soda Ash Dense	Bags 27" x 46"	4.2 lb.	2 lb.
58% Soda Ash Dense	BBls.	47.2 lb.	300 lb.
58% Soda Ash Ordinary	BBls.	42.2 lb.	300 lb.
58% Soda Ash Ordinary	Bags 25" x 45"	4.1 lb.	1 lb.
Solvay Laundry Soda	BBls.	30.2 lb.	22 lb.
Solvay Cleansing Soda X	BBls.	30.2 lb.	22 lb.
Solvay Cleansing Soda XX	BBls.	30.2 lb.	22 lb.
Timmers Soda	BBls.	30.2 lb.	22 lb.
Laundry Soda Special	BBls.	30.2 lb.	22 lb.
Snow Flake	BBls.	30.2 lb.	22 lb.
Snow Flake	BBls.	30.2 lb.	22 lb.
Snow Flake Special	1/2 Bbl.	67.2 lb.	22 lb.
Snow Flake Dense	1/2 Bbl.	67.2 lb.	22 lb.
Snow Flake Light	Bags 27" x 46"	30.2 lb.	2 lb.
Caustic Ash 15%	BBls.	42.2 lb.	22 lb.
Caustic Ash 25%	BBls.	42.2 lb.	22 lb.
Caustic Ash 36%	BBls.	42.2 lb.	22 lb.
Caustic Ash 45%	BBls.	42.2 lb.	22 lb.
Timmers Alkali	BBls.	42.2 lb.	22 lb.
76% Caustic Soda, Solid (1)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (2)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (3)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (4)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (5)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (6)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (7)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (8)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (9)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (10)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (11)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (12)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (13)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (14)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (15)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (16)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (17)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (18)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (19)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (20)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (21)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (22)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (23)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (24)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (25)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (26)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (27)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (28)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (29)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (30)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (31)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (32)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (33)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (34)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (35)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (36)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (37)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (38)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (39)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (40)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (41)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (42)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (43)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (44)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (45)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (46)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (47)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (48)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (49)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (50)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (51)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (52)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (53)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (54)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (55)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (56)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (57)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (58)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (59)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (60)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (61)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (62)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (63)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (64)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (65)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (66)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (67)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (68)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (69)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (70)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (71)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (72)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (73)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (74)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (75)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (76)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (77)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (78)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (79)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (80)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (81)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (82)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (83)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (84)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (85)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (86)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (87)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (88)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (89)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (90)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (91)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (92)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (93)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (94)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (95)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (96)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (97)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (98)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (99)	11" drums	94 lb.	67.5 lb.
76% Caustic Soda, Solid (100)	11" drums	94 lb.	67.5 lb.

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# TALC PRODUCTS COMPANY, INC.

120 Broadway  
NEW YORK, N. Y.

MINE AND MILL  
Glendon, North Carolina

Cable Address  
"STALLFORTH", New York

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## PRODUCTS

Ground Talc

Crayons

## GROUND TALC

### Quality

100 per cent. of our product will pass through a  
200 mesh screen

Minimum free silica content

### Physical and Chemical Characteristics

Our material is aluminum silicate, the mineral known as pyrophyllite. It is of a foliated, plate-like structure.

Specific Gravity 2.76

No calcium carbonate

Ferric oxide less than 1%

Greasy feel, excellent slip and plasticity; high retention value.

Entirely free from grease.

Color is white or cream, dependent on prospective uses.

### Uses

Filler in high grade book papers, waterproof and fireproof paints and enamels, soaps, textiles, rubber goods, lubricants.

Dusting, polishing and lubricating material in the rubber, glass, tar-paper, leather and cork industries. These are the main uses so far established.

Attention is called to the various bulletins issued by the Bureau of Mines on the subject of talc and its numerous uses.

## COOPERATION

We are anxious to serve you in developing a grade of material suitable for your particular needs.

## MINE AND MILL

Located at Glendon, North Carolina.

Our plant is of recent design and is specially adapted to turning out a uniform high-grade product without interruption. The wet method of grinding is employed, using the Dorr system of classification.

## CRAYONS

We produce Crayons of the standard sizes in the basic colors, and with varying degrees of hardness. Our Technical Department will gladly cooperate with the user as to the quality and type best suited for any special purposes.

An interesting list of many of the uses for Talc will be found in a general representation on page 1193, of this volume.

**LIMESTONE—CaCO<sub>3</sub>**

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No. 1	No. 2	No. 3	No. 4
Soda Ash Sodium Carbonate Na <sub>2</sub> CO <sub>3</sub> Per Cent	Actual Alkali Sodium Oxide Na <sub>2</sub> O Per Cent	Newcastle Test Sodium Oxide Na <sub>2</sub> O Per Cent	N. Y. & Liv. Sodium Oxide Na <sub>2</sub> O Per Cent
79.51	46.5	47.11	48.00
80.37	47.0	47.62	48.51
81.22	47.5	48.12	49.03
82.07	48.0	48.63	49.54
82.93	48.5	49.14	50.06
83.78	49.0	49.64	50.58
84.64	49.5	50.15	51.09
85.48	50.0	50.66	51.61
86.34	50.5	51.16	52.12
87.19	51.0	51.67	52.64
88.05	51.5	52.18	53.16
88.90	52.0	52.68	53.67
89.76	52.5	53.19	54.19
90.61	53.0	53.70	54.70
91.47	53.5	54.20	55.22
92.32	54.0	54.71	55.74
93.18	54.5	55.22	56.25
94.03	55.0	55.72	56.77
94.89	55.5	56.23	57.29
95.74	56.0	56.74	57.80
96.60	56.5	57.24	58.32
97.45	57.0	57.75	58.83
98.31	57.5	58.26	59.35
99.16	58.0	58.76	59.87
100.00	58.5	59.27	60.38

**TABLE FOR COMPARING DIFFERENT SYSTEMS OF ALKALIMETRY FOR CAUSTIC SODA**

Caustic Soda is sold on its strength in Na<sub>2</sub>O, as indicated in the New York and Liverpool Test column below.

The price is always based on 60% Caustic, with a proportionate addition for the higher percentages.

No. 1	No. 2	No. 3	No. 4
Caustic Soda Sodium Hydroxide NaOH Per Cent	Actual Alkali Sodium Oxide Na <sub>2</sub> O Per Cent	Newcastle Test Sodium Oxide Na <sub>2</sub> O Per Cent	N. Y. & Liv. Sodium Oxide Na <sub>2</sub> O Per Cent
74.83	58.0	58.76	59.87
75.48	58.5	59.27	60.38
76.12	59.0	59.77	60.90
76.77	59.5	60.28	61.42
77.40	60.0	60.79	61.93
78.05	60.5	61.30	62.45
78.70	61.0	61.80	62.97
79.35	61.5	62.31	63.48
80.00	62.0	62.82	64.00
80.65	62.5	63.32	64.52
81.29	63.0	63.83	65.04
81.94	63.5	64.34	65.55
82.58	64.0	64.84	66.06
83.23	64.5	65.35	66.58
83.87	65.0	65.85	67.10
84.52	65.5	66.36	67.61
85.16	66.0	66.87	68.13
85.81	66.5	67.37	68.65
86.45	67.0	67.88	69.16
87.10	67.5	68.39	69.68
87.74	68.0	68.89	70.19
88.39	68.5	69.40	70.71
89.03	69.0	69.91	71.23
89.67	69.5	70.41	71.74
90.30	70.0	70.92	72.26
90.95	70.5	71.43	72.77
91.60	71.0	71.93	73.29
92.25	71.5	72.44	73.81
92.90	72.0	72.95	74.32
93.55	72.5	73.45	74.84
94.19	73.0	73.96	75.35
94.84	73.5	74.47	75.87
95.48	74.0	74.97	76.39
96.13	74.5	75.48	76.90
96.77	75.0	75.99	77.42
97.42	75.5	76.49	77.94
98.06	76.0	77.00	78.45
98.71	76.5	77.51	78.97
99.35	77.0	78.01	79.49
100.00	77.5	78.52	80.00

**SUMMARY OF SHIPPING WEIGHTS OF SOLVAY PRODUCTS**  
Net Weight—Pounds

Product	Container	Gross	Net
58% Soda Ash Light	Bags 27" x 46"	30.2 lb.	29 lb.
58% Soda Ash Light	Bbls.	192 lb.	180 lb.
58% Soda Ash Dense	Bags 27" x 46"	42.2 lb.	40 lb.
58% Soda Ash Dense	Bbls.	272 lb.	260 lb.
58% Soda Ash Ordinary	Bbls.	192 lb.	180 lb.
58% Soda Ash Ordinary	Bags 27" x 46"	42.2 lb.	40 lb.
Solvay Laundry Soda	Bbls.	302 lb.	280 lb.
Solvay Cleansing Soda X	Bbls.	302 lb.	280 lb.
Solvay Cleansing Soda XX	Bbls.	302 lb.	280 lb.
Timmers Soda	Bbls.	302 lb.	280 lb.
Laundry Soda Special	Bbls.	302 lb.	280 lb.
Snow Flake	Bbls.	302 lb.	280 lb.
Snow Flake	Bbls.	302 lb.	280 lb.
Snow Flake Special	1/2 Bbl	151 lb.	140 lb.
Snow Flake Dense	1/2 Bbl	151 lb.	140 lb.
Snow Flake Light	Bags 27" x 46"	30.2 lb.	29 lb.
Caustic Ash 15%	Bbls.	192 lb.	180 lb.
Caustic Ash 25%	Bbls.	192 lb.	180 lb.
Caustic Ash 36%	Bbls.	192 lb.	180 lb.
Caustic Ash 45%	Bbls.	192 lb.	180 lb.
Timmers Alkali	Bbls.	192 lb.	180 lb.
76% Caustic Soda, Solid (1)	11" drums	115 kilos	100 kilos
76% Caustic Soda, Solid (2)	15" drums	145 kilos	125 kilos
76% Caustic Soda, Solid (3)	19" drums	185 kilos	165 kilos
76% Caustic Soda, Solid (4)	23" drums	225 kilos	205 kilos
76% Caustic Soda, Solid (5)	27" drums	265 kilos	245 kilos
76% Caustic Soda, Solid (6)	31" drums	305 kilos	285 kilos
76% Caustic Soda, Solid (7)	35" drums	345 kilos	325 kilos
76% Caustic Soda, Solid (8)	39" drums	385 kilos	365 kilos
76% Caustic Soda, Solid (9)	43" drums	425 kilos	405 kilos
76% Caustic Soda, Solid (10)	47" drums	465 kilos	445 kilos
76% Caustic Soda, Solid (11)	51" drums	505 kilos	485 kilos
76% Caustic Soda, Solid (12)	55" drums	545 kilos	525 kilos
76% Caustic Soda, Solid (13)	59" drums	585 kilos	565 kilos
76% Caustic Soda, Solid (14)	63" drums	625 kilos	605 kilos
76% Caustic Soda, Solid (15)	67" drums	665 kilos	645 kilos
76% Caustic Soda, Solid (16)	71" drums	705 kilos	685 kilos
76% Caustic Soda, Solid (17)	75" drums	745 kilos	725 kilos
76% Caustic Soda, Solid (18)	79" drums	785 kilos	765 kilos
76% Caustic Soda, Solid (19)	83" drums	825 kilos	805 kilos
76% Caustic Soda, Solid (20)	87" drums	865 kilos	845 kilos
76% Caustic Soda, Solid (21)	91" drums	905 kilos	885 kilos
76% Caustic Soda, Solid (22)	95" drums	945 kilos	925 kilos
76% Caustic Soda, Solid (23)	99" drums	985 kilos	965 kilos
76% Caustic Soda, Solid (24)	103" drums	1025 kilos	1005 kilos
76% Caustic Soda, Solid (25)	107" drums	1065 kilos	1045 kilos
76% Caustic Soda, Solid (26)	111" drums	1105 kilos	1085 kilos
76% Caustic Soda, Solid (27)	115" drums	1145 kilos	1125 kilos
76% Caustic Soda, Solid (28)	119" drums	1185 kilos	1165 kilos
76% Caustic Soda, Solid (29)	123" drums	1225 kilos	1205 kilos
76% Caustic Soda, Solid (30)	127" drums	1265 kilos	1245 kilos
76% Caustic Soda, Solid (31)	131" drums	1305 kilos	1285 kilos
76% Caustic Soda, Solid (32)	135" drums	1345 kilos	1325 kilos
76% Caustic Soda, Solid (33)	139" drums	1385 kilos	1365 kilos
76% Caustic Soda, Solid (34)	143" drums	1425 kilos	1405 kilos
76% Caustic Soda, Solid (35)	147" drums	1465 kilos	1445 kilos
76% Caustic Soda, Solid (36)	151" drums	1505 kilos	1485 kilos
76% Caustic Soda, Solid (37)	155" drums	1545 kilos	1525 kilos
76% Caustic Soda, Solid (38)	159" drums	1585 kilos	1565 kilos
76% Caustic Soda, Solid (39)	163" drums	1625 kilos	1605 kilos
76% Caustic Soda, Solid (40)	167" drums	1665 kilos	1645 kilos
76% Caustic Soda, Solid (41)	171" drums	1705 kilos	1685 kilos
76% Caustic Soda, Solid (42)	175" drums	1745 kilos	1725 kilos
76% Caustic Soda, Solid (43)	179" drums	1785 kilos	1765 kilos
76% Caustic Soda, Solid (44)	183" drums	1825 kilos	1805 kilos
76% Caustic Soda, Solid (45)	187" drums	1865 kilos	1845 kilos
76% Caustic Soda, Solid (46)	191" drums	1905 kilos	1885 kilos
76% Caustic Soda, Solid (47)	195" drums	1945 kilos	1925 kilos
76% Caustic Soda, Solid (48)	199" drums	1985 kilos	1965 kilos
76% Caustic Soda, Solid (49)	203" drums	2025 kilos	2005 kilos
76% Caustic Soda, Solid (50)	207" drums	2065 kilos	2045 kilos
76% Caustic Soda, Solid (51)	211" drums	2105 kilos	2085 kilos
76% Caustic Soda, Solid (52)	215" drums	2145 kilos	2125 kilos
76% Caustic Soda, Solid (53)	219" drums	2185 kilos	2165 kilos
76% Caustic Soda, Solid (54)	223" drums	2225 kilos	2205 kilos
76% Caustic Soda, Solid (55)	227" drums	2265 kilos	2245 kilos
76% Caustic Soda, Solid (56)	231" drums	2305 kilos	2285 kilos
76% Caustic Soda, Solid (57)	235" drums	2345 kilos	2325 kilos
76% Caustic Soda, Solid (58)	239" drums	2385 kilos	2365 kilos
76% Caustic Soda, Solid (59)	243" drums	2425 kilos	2405 kilos
76% Caustic Soda, Solid (60)	247" drums	2465 kilos	2445 kilos
76% Caustic Soda, Solid (61)	251" drums	2505 kilos	2485 kilos
76% Caustic Soda, Solid (62)	255" drums	2545 kilos	2525 kilos
76% Caustic Soda, Solid (63)	259" drums	2585 kilos	2565 kilos
76% Caustic Soda, Solid (64)	263" drums	2625 kilos	2605 kilos
76% Caustic Soda, Solid (65)	267" drums	2665 kilos	2645 kilos
76% Caustic Soda, Solid (66)	271" drums	2705 kilos	2685 kilos
76% Caustic Soda, Solid (67)	275" drums	2745 kilos	2725 kilos
76% Caustic Soda, Solid (68)	279" drums	2785 kilos	2765 kilos
76% Caustic Soda, Solid (69)	283" drums	2825 kilos	2805 kilos
76% Caustic Soda, Solid (70)	287" drums	2865 kilos	2845 kilos
76% Caustic Soda, Solid (71)	291" drums	2905 kilos	2885 kilos
76% Caustic Soda, Solid (72)	295" drums	2945 kilos	2925 kilos
76% Caustic Soda, Solid (73)	299" drums	2985 kilos	2965 kilos
76% Caustic Soda, Solid (74)	303" drums	3025 kilos	3005 kilos
76% Caustic Soda, Solid (75)	307" drums	3065 kilos	3045 kilos
76% Caustic Soda, Solid (76)	311" drums	3105 kilos	3085 kilos
76% Caustic Soda, Solid (77)	315" drums	3145 kilos	3125 kilos
76% Caustic Soda, Solid (78)	319" drums	3185 kilos	3165 kilos
76% Caustic Soda, Solid (79)	323" drums	3225 kilos	3205 kilos
76% Caustic Soda, Solid (80)	327" drums	3265 kilos	3245 kilos
76% Caustic Soda, Solid (81)	331" drums	3305 kilos	3285 kilos
76% Caustic Soda, Solid (82)	335" drums	3345 kilos	3325 kilos
76% Caustic Soda, Solid (83)	339" drums	3385 kilos	3365 kilos
76% Caustic Soda, Solid (84)	343" drums	3425 kilos	3405 kilos
76% Caustic Soda, Solid (85)	347" drums	3465 kilos	3445 kilos
76% Caustic Soda, Solid (86)	351" drums	3505 kilos	3485 kilos
76% Caustic Soda, Solid (87)	355" drums	3545 kilos	3525 kilos
76% Caustic Soda, Solid (88)	359" drums	3585 kilos	3565 kilos
76% Caustic Soda, Solid (89)	363" drums	3625 kilos	3605 kilos
76% Caustic Soda, Solid (90)	367" drums	3665 kilos	3645 kilos
76% Caustic Soda, Solid (91)	371" drums	3705 kilos	3685 kilos
76% Caustic Soda, Solid (92)	375" drums	3745 kilos	3725 kilos
76% Caustic Soda, Solid (93)	379" drums	3785 kilos	3765 kilos
76% Caustic Soda, Solid (94)	383" drums	3825 kilos	3805 kilos
76% Caustic Soda, Solid (95)	387" drums	3865 kilos	3845 kilos
76% Caustic Soda, Solid (96)	391" drums	3905 kilos	3885 kilos
76% Caustic Soda, Solid (97)	395" drums	3945 kilos	3925 kilos
76% Caustic Soda, Solid (98)	399" drums	3985 kilos	3965 kilos
76% Caustic Soda, Solid (99)	403" drums	4025 kilos	4005 kilos
76% Caustic Soda, Solid (100)	407" drums	4065 kilos	4045 kilos

# TEXAS GULF SULPHUR COMPANY

41 EAST 42ND STREET, NEW YORK, N. Y.

DEPOSIT AND PLANT  
Gulf, Matagorda County, Texas

Cable Address  
"LONSTARSUL", New York  
Western Union Code, 5 letter Edition

## PRODUCT

Crude sulfur (brimstone) 99½% pure, free from arsenic, selenium and tellurium.

## SULFUR INDUSTRY

The United States produces the only sulfur which is obtained directly in a substantially pure state, requiring no rectification. This fact, together with the vast tonnage produced by the three companies which mine virtually all the American sulfur, makes possible the present domination of the sulfur industry by the United States.

## DEPOSIT

The "Big Dome" deposit of the Texas Gulf Sulphur Co. is located at Gulf, Matagorda County, Texas. The main deposit is from 800 to 1000 feet below the surface. The total holdings of this company are approximately 4000 acres.

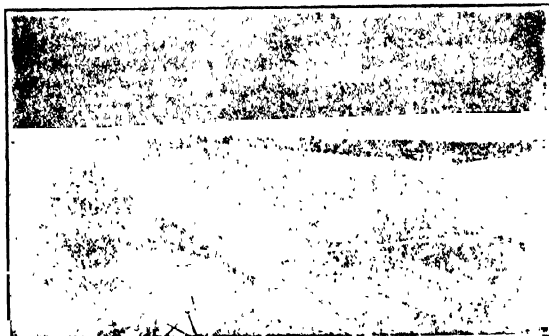
## PRODUCTION

Sulfur production by this company was initiated in March, 1919, and has been practically continuous at the rate of 1000 to 5000 gross tons daily. Practically all sulfur mined in the United States is obtained by the hot water method, and producers have carried enormous stocks above ground.

The production in the two and a half years since operations were initiated exceeds two million (2,000,000) long tons, which is probably in excess of the total production of all other sulfur producers.

## STOCKS AND SHIPPING FACILITIES

Large stocks are always carried at the mine, as well as at the port of Galveston, where facilities are maintained for loading bulk sulfur cargoes for delivery to all parts of the world.



STORAGE BINS AND LOADING TRACKS

## USES OF SULFUR

The most important use of crude sulfur is for the manufacture of sulfuric acid. The advantages of the use of sulfur instead of pyrites are many and marked: A very much smaller amount of material is handled (less than one-half); the burning equipment for the generation of the sulfur dioxide is simple and inexpensive; no large tonnage of cinders or other residue remains to be disposed of; American sulfur is constant in composition, free from arsenic, selenium, tellurium, and other interfering impurities, thereby yielding a purer acid; a higher rate of production per given unit of lead chamber space is obtained.

A further extremely important use of sulfur is the pulp and paper industry.

Sulfur dioxide finds extensive use in the production of sodium sulfite, sodium bisulfite, sodium sulfate and other salts.

Sulfur is being used in large amounts as a direct fertilizer; in fertilizer composts; as an insecticide and fungicide; as well as for the production of lime-sulfur and other insecticidal sprays.

In the rubber industry sulfur is indispensable, as it is the means by which crude rubber is vulcanized.

Other important uses are the production of carbon bisulfide, the important solvent and the raw material for the manufacture of carbon tetrachloride.

Further uses are for the production of cements, fumigating, medicine (both internally and externally), and the bleaching of straw and the like, manufacture of matches, sewer-pipe joints (mixed with sand), etc.

## SULFUR MIXTURES

The ordinary mixture of sand and sulfur has merits which deserve a wider knowledge of its properties. The mixture which is best for most uses is that of 40 of sulfur and 60 of sand (parts by weight). The tensile strengths of sulfur-sand mixtures as measured in the usual manner for testing cement were as follows:

Percentage of Sulfur by Weight	Tensile Strength Lb. per Sq. In.
25	90
35	310
40	400
45	310
50	110
100	250

Other fillers have given tensile strengths of 800 and even 1100 lb. The 40-60 sulfur-sand mixture can be used as an acid-resistant concrete, for making acid-resisting pipe, tanks, gutters, launders, etc.

In the case of acid tanks, the sand should be free from limestone or other acid-soluble constituents.

Pipes cast of this sulfur-sand mixture show no deterioration after one year in 5 per cent. hydrochloric or 5 per cent. sulfuric acid. The ordinary organic acids have no effect on such a mixture.

## PROSPECTIVE USES OF SULFUR

Sulfur possesses the following physical properties which suggest certain possible important uses:

Poor conductivity of heat; Low electrical conductivity; Resistance to wetting by water; Inertness toward most acids; Physical strength; Non-compressibility; Fusibility.

These properties suggest: Heat-insulating materials; Electrical insulation; Waterproof cements; Acid-proof cements; Acid-proof construction materials.

The objectionable property of sulfur, its brittleness, can readily be overcome by mixing it with sand, asbestos, slag-wool, paper-pulp, etc., or by reinforcing it with wire screen. Mixing it with inert materials would also materially reduce the fire hazard.

Sulfur is odorless and practically tasteless, and is flammable only in cases of application of fire.

## PHYSICAL AND CHEMICAL PROPERTIES

**Boiling-point**—444.6°C. or 832.3°F.

**Compressibility**—Average fractional change of volume caused by 1 megabar change in pressure between 100-500 megabars = 0.0000125. 1 Megabar = 0.987 Atmospheres.

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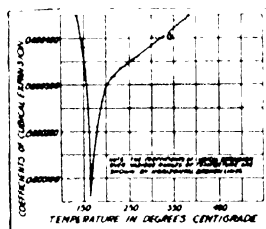
**Electrical Conductivity**—(Measured on a 1 cm. cube, as reciprocal value of Resistivity in ohms)

TEMPERATURE		CONDUCTIVITY
Cent.	Fahr.	
22°	72°	1.5 × 10 <sup>-12</sup>
69°	156°	0.24 × 10 <sup>-12</sup>
115°	239°	0.100 × 10 <sup>-12</sup>
130°	266°	0.5 × 10 <sup>-12</sup>
430°	806°	0.1 × 10 <sup>-12</sup>

Compare		CONDUCTIVITY
Porcelain	Fahr.	
Mica	0.1	10 <sup>-12</sup>
Fluorite	1.0	10 <sup>-12</sup>

It requires 20,000 volts AC to produce a disruptive discharge through  $\frac{1}{4}$  inch of molten sulfur while good transformer oil requires 30,000 volts and air is pierced at 6000 volts.

#### Expansion— Cubical



COEFFICIENTS OF CUBICAL EXPANSION

Formed, e.g., by action of dilute acids on polysulfides. Generally called amorphous, but shown by Smith and Brownlee to be crystalline.

There are several other modifications of crystalline sulfur of scientific interest but not of general importance.

#### Liquid

At 113°C. or 235°F. Sp. gr. 1.81

Contains: Sulfur (Liquid soluble) S<sub>L</sub>, Sulfur (Liquid insoluble, or amorphous) S<sub>A</sub>.

The proportion of S<sub>A</sub> to S<sub>L</sub> increases with the temperature.

#### Amorphous—S<sub>A</sub>

Solid—Sp. gr. 1.89

Plastic Sulfur—Formed by heating sulfur above viscous stage, 162°C. or 324°F. and cooling quickly. Sp. gr. 1.88.

Elastic Sulfur—Formed by heating sulfur above 400°C. or 752°F. and pouring in thin stream into liquid air. Its elastic properties are soon lost.

**Heat Conductivity**—(Measured as the number of gram calories transmitted in one second through a plate 1 cm. thick and having surfaces 1 sq. cm. in area when opposite faces differ in temperature by 1°C.)

20°–100°C. or 68°–212°F. 0.0006—Gm. Calories

#### Heat of Combustion

	G. cal. per	B. T. U.
	kg. Sulfur	per lb.
S + O <sub>2</sub> to SO <sub>2</sub> . . . . .	2200	3960
S to H <sub>2</sub> SO <sub>4</sub> (dilute) . . . . .	2450	4410
S to H <sub>2</sub> SO <sub>4</sub> (dilute) . . . . .	4450	8010

#### Heat of Fusion

	G. cal. per kg.	B. T. U. per lb.
Rhombic at 100°C. or 212°F. . . . .	11.9	26.8
Monoclinic at 100°C. or 212°F. . . . .	11.5	20.7
To form pure liquid Sulfur (S <sub>A</sub> ) . . . . .	14.5	26.1
From Rhombic . . . . .	11.1	20.9

#### Heat of Solution in Carbon Disulfide

	G. cal. per kg.	B. T. U. per lb.
Dilute solution . . . . .	-11.89	-21.4
Saturated solution . . . . .	-11.55	-20.9

#### Heat of Vaporization

Temperature	G. cal. per kg.	B. T. U. per lb.
Cent. Fahr.		
114.6° 832.3°	70 (approx.)	126 (approx.)

#### Ignition Temperature—248°C. or 478°F.

International Atomic Weight 1920 = 32.06.

#### Melting-point

	Cent.	Fahr.
Rhombic . . . . .	112.4°	235°
Monoclinic . . . . .	119.25°	246.7°
Natural Freezing point S <sub>A</sub> and S <sub>L</sub> in equilibrium (96.3% S <sub>A</sub> , 3.7% S <sub>L</sub> ) 110.2°C. or 230.4°F.		

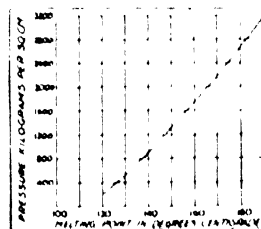
#### Specific Heat

	Temperature	Sp. Ht.
	Cent. Fahr.	
Rhombic . . . . .	0°–95°	0.1751
Liquid . . . . .	160°–201°	0.279
	201°–233°	0.281

#### Specific Gravity

Amorphous	1.956
Yellow	2.046
Monoclinic	1.958
Rhombic	2.06

#### Melting-point change



#### CHANGE OF MELTING-POINT WITH PRESSURE

##### Solubilities

Solvent	Temperature		Solubility g. in 100 g. Solution
	Cent.	Fahr.	
Amyl Alcohol	9.4°	20.3°	1.5
	110	230	2.1
Aniline	89.5	193.1	8.3
Benzol	110	266	46.2
Carbon Disulfide	25	77	2.1
	70	158	8.0
Carbon Tetrachloride	10	50	13.5
	0	32	18
Chloroform	20	68	29.5
Coal tar Oil	50	122	59
	100	212	92
Carbon Tetrachloride	25	77	0.86
Coal tar Oil	12	71.6	1.2
Sp. Gr. 0.87 . . . . .	15	59	2
Sp. Gr. 1.02 . . . . .	15	59	0.5
Ethyl Ether . . . . .	110	230	51.5
Linseed Oil . . . . .	21.5	70.7	0.97
	15	59	0.4
Olive Oil (Sp. Gr. 0.885) . . . . .	160	320	9.0
	15	59	2.2
Sulfur Chloride . . . . .	130	266	39
	0	32	11
	55.2	131.4	43
	86	186.8	89
Phenol . . . . .	17.5	63.5	26.7
Toluol . . . . .	23	71.4	1.48
Turpentine Oil of . . . . .	16	60.8	1.33
Boiling point . . . . .			13.9

##### Surface Tension

Temperature		Surface Tension Mg. per mm.
Cent.	Fahr.	
120°	248°	5.7
131°	267.8°	6.12
146°	294.8°	6.65
195°	383°	6.62

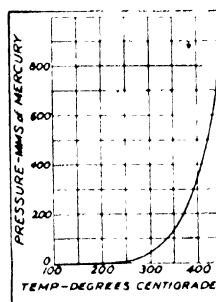
**Tensile Strength** 200 pounds per square inch (approximate)

**Vapor Density** At B. P. corresponds approximately to formula S<sub>8</sub>. At 1000°C. or 1832°F. corresponds approximately to formula S<sub>2</sub>.

##### Transition Temperature

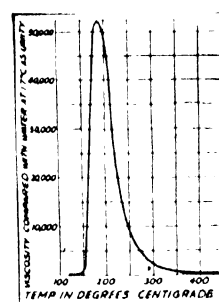
MONOCLINIC		RHOMBIC	
Pressure		Temperature	
Kg. cm <sup>2</sup>	Hrs. in °	Cent.	Fahr.
10.6	15	98°	208.4°
123	175	100.1°	212.2°
634	907	120°	248°
1950	1920	150°	302°

##### Vapor Pressure



VAPOR PRESSURE OF  
SULPHUR

##### Viscosity



CHANGE OF VISCOSITY  
OF LIQUID SULPHUR

**Weight per Cubic Foot**—Broken sulfur in bins, 85 lbs. per cubic foot.

**Angle of Repose**—35 Degrees

# TOWER MANUFACTURING CO., INC.

FACTORIES  
Brooklyn, N. Y.  
Newark, N. J.

Dyestuffs Department  
326 BROADWAY, NEW YORK, N. Y.

Cable Address  
"JOURNALIZE", New York

## PRODUCTS

Para-phenylenediamine and a complete assortment of other Fur Colors.

**Methyl Violet**

**Fuchsine**

**Rosaniline Base**

**Magenta Base**

**Alkali Blue**

**Indigotine**

**Indigo Extract**

**Indophenal Colors**

## FUR COLORS

A complete assortment of Fur Colors, as follows:

Para-phenylenediamine—designed under our trade name "Furol D," also known as Fur Black.

"Furol P"—also known as Fur Brown.

"Furol A"—which produces a blue-black shade.

"Furol GG"—which produces a yellowish tint.

"Furol DB"—also known as Fur Blue.

"Furol X"—which also produces a brown tint.

"Furol DD"—which produces a blue shade.

Para-phenylenediamine is packed for export in steel drums, gross 410 lb., tare 60, net 350 lb., measurements 32" x 24", cubic contents 8.7 cu. ft. Domestic packing wooden barrels containing 275 lb. gross, tare 25 lb., net 250 lb.

All other Fur Colors are packed in kegs containing 100 pounds net.

## METHYL VIOLET

This material is full strength, very soluble, and is available in either lump or powder form.

Packed in wooden barrels,

Lumps: gross 335 lb., tare 75, net 260 lb.,

Powder: gross 375 lb., tare 75, net 300 lb.,

measurements 34½" x 24½" x 21",

cubic contents 8.0 cu. ft.

## FUCHSINE

This material is full strength, very soluble and is available in the form of large diamond crystals, crystalline and powder.

Packed in wooden barrels,

Large diamond crystals and crystalline: gross 375 lb., tare 75, net 300 lb.,

Powder: gross 300 lb., tare 75, net 225 lb.,

measurements 34½" x 24½" x 21",

cubic contents 8.0 cu. ft.

## ROSANILINE BASE

This material is full strength, very soluble and is available in the form of a powder.

Packed in wooden barrels,

gross 375 lb., tare 75, net 300 lb.,

measurements 34½" x 24½" x 21",

cubic contents 8.0 cu. ft.

## MAGENTA BASE

This material is full strength, very soluble and is available in the form of a powder.

Packed in wooden barrels,

gross 375 lb., tare 75, net 300 lb.,

measurements 34½" x 24½" x 21",

cubic contents 8.0 cu. ft.

## ALKALI BLUE

This is full strength and a very soluble product.

Packed in 100 pound kegs net.

## INDIGOTINE "A"

This is standard quality material.

Packed in barrels, gross 570 lb., tare 70 lb., net 500 lb.

## INDIGOTINE "B" CONC.

This is a concentrated type of material, with a very bright shade.

Packed in barrels, gross 570 lb., tare 70 lb., net 500 lb.

## INDIGO EXTRACT

This is standard quality material.

Packed in barrels, gross 520 lb., tare 70 lb., net 450 lb.

## INDOPHENAL COLORS

This is a new group or series of dyes originated and manufactured exclusively by this Company. They are characterized by their brilliancy of shade and remarkable fastness to light, washing and rubbing, and superior fastness to acid, alkali, fulling and boiling. The Indophenal colors partake of the nature of sulphur colors in that they are reduced by the addition of Sodium Sulphide, thus possessing the added advantage of simplicity in the method of application.

The following types are available for regular delivery:

Indophenal Blue R Conc.—A brilliant, exceedingly red shade of blue, of very great concentration.

Indophenal Blue R—Standard concentration, of great brilliancy and extreme red shade.

Indophenal Sky Blue—A brilliant, highly concentrated greenish type of blue of great clearness of shade.

Other equally important types are in preparation, and will be ready for distribution shortly.



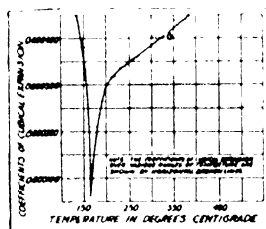
**Electrical Conductivity**—(Measured on a 1 cm. cube, as reciprocal value of Resistivity in ohms.)

TEMPERATURE		CONDUCTIVITY
Cent.	Fahr.	
22°	72°	1.5 × 10 <sup>-12</sup>
69°	156°	0.24 × 10 <sup>-12</sup>
115°	239°	0.100 × 10 <sup>-12</sup>
130°	266°	0.5 × 10 <sup>-12</sup>
430°	806°	0.1 × 10 <sup>-12</sup>

Compare		CONDUCTIVITY
Porcelain	Fahr.	
Mica	0.1	10 <sup>-12</sup>
Fluorite	1.0	10 <sup>-12</sup>

It requires 20,000 volts AC to produce a disruptive discharge through  $\frac{1}{4}$  inch of molten sulfur while good transformer oil requires 30,000 volts and air is pierced at 6000 volts.

#### Expansion— Cubical



#### COEFFICIENTS OF CUBICAL EXPANSION

dilute acids on polysulfides. Generally called amorphous, but shown by Smith and Brownlee to be crystalline.

There are several other modifications of crystalline sulfur of scientific interest but not of general importance.

#### Liquid

At 113°C. or 235°F. Sp. gr. 1.81

Contains: Sulfur (Liquid soluble) S<sub>L</sub>, Sulfur (Liquid insoluble, or amorphous) S<sub>A</sub>.

The proportion of S<sub>A</sub> to S<sub>L</sub> increases with the temperature.

#### Amorphous—S<sub>A</sub>

Solid—Sp. gr. 1.89

Plastic Sulfur—Formed by heating sulfur above viscous stage, 162°C. or 324°F. and cooling quickly. Sp. gr. 1.88

Elastic Sulfur—Formed by heating sulfur above 400°C. or 752°F. and pouring in thin stream into liquid air. Its elastic properties are soon lost.

**Heat Conductivity**—(Measured as the number of gram calories transmitted in one second through a plate 1 cm. thick and having surfaces 1 sq. cm. in area when opposite faces differ in temperature by 1°C.)

20°–100°C. or 68°–212°F. 0.0006—Gm. Calories

#### Heat of Combustion

	G. cal. per K. Sulfur	B. T. U. per lb.
S + O <sub>2</sub> to SO <sub>2</sub> . . . . .	2200	3960
S to H <sub>2</sub> SO <sub>4</sub> (dilute) . . . . .	2450	4410
S to H <sub>2</sub> SO <sub>4</sub> (dilute) . . . . .	4450	8010

#### Heat of Fusion

	G. cal. per K.	B. T. U. per lb.
Rhombic at 100°C. or 212°F. . . . .	11.9	26.8
Monoclinic at 100°C. or 212°F. . . . .	11.5	20.7
To form pure liquid Sulfur (S <sub>L</sub> ) . . . . .	14.5	26.1
From Rhombic . . . . .	11.1	20.9

#### Heat of Solution in Carbon Disulfide

	G. cal. per K.	B. T. U. per lb.
Dilute solution . . . . .	-11.89	-21.4
Saturated solution . . . . .	-11.55	-20.9

#### Heat of Vaporization

Temperature	G. cal. per K.	B. T. U. per lb.
Cent. Fahr.		
114.6° 832.3°	70 (approx.)	126 (approx.)

#### Ignition Temperature—248°C. or 478°F.

International Atomic Weight 1920 = 32.06.

#### Melting-point

	Temperature	
Rhombic . . . . .	112° Fahr.	235° Cent.
Monoclinic . . . . .	119.25° Fahr.	246.7° Cent.
Natural Freezing point S <sub>L</sub> and S <sub>A</sub> in equilibrium (96.3% S <sub>L</sub> , 3.7% S <sub>A</sub> ) 110.2°C. or 230.4°F.		

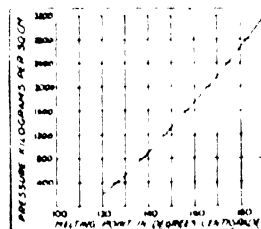
#### Specific Heat

	Temperature	Sp. Ht.
	Cent. Fahr.	
Rhombic . . . . .	0°–95°	0.1751
Liquid . . . . .	160°–201°	0.279
	201°–233°	0.281

#### Specific Gravity

Amorphous	1.956
Yellow	2.046
Monoclinic	1.958
Rhombic	2.06

#### Melting-point change



#### CHANGE OF MELTING-POINT WITH PRESSURE

#### Solubilities

Solvent	Temperature		Solubility g. in 100 g. Solution
	Cent.	Fahr.	
Amyl Alcohol	9.4°	20.3°	1.5
	110	230	2.1
Aniline	89.5	193.1	8.3
	110	266	46.2
Benzol	25	77	2.1
	70	158	8.0
Carbon Disulfide	10	50	10.5
	0	32	13.5
	20	68	18
	50	122	29.5
	100	212	59
Carbon Tetrachloride	25	77	0.86
Chloroform	12	54	1.2
Coal-tar Oil	15	59	2
Sp. Gr. 0.87 . . . . .	100	212	13
Sp. Gr. 1.02 . . . . .	15	59	0.5
	110	230	5.5
Ethyl Ether	21.5	70.7	0.97
	15	59	0.4
Linseed Oil	160	320	9.0
Olive Oil (Sp. Gr. 0.885)	15	59	2.2
	130	266	39
Sulfur Chloride	0	32	11
	55.2	131.4	43
	86	186.8	89
Phenol	17.5	63.5	26.7
Toluol	23	73.4	1.48
Turpentine, Oil of	16	60.8	1.33
Boiling point			13.9

#### Surface Tension

Temperature		Surface Tension Mg. per mm.
Cent.	Fahr.	
120°	248°	5.7
131°	267.8°	6.12
146°	294.8°	6.65
195°	383°	6.62

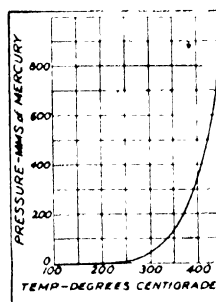
**Tensile Strength** 200 pounds per square inch (approximate)

**Vapor Density** At B. P. corresponds approximately to formula S<sub>8</sub>. At 1000°C. or 1832°F. corresponds approximately to formula S<sub>2</sub>.

#### Transition Temperature

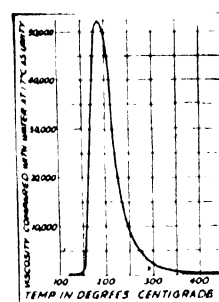
MONOCLINIC		RHOMBIC	
Pressure		Temperature	
Kg. cm <sup>2</sup>	Hrs. in °	Cent.	Fahr.
10.6	15	98°	208.4°
123	175	100.1°	212.2°
634	907	120°	248°
1950	1920	150°	302°

#### Vapor Pressure



#### VAPOR PRESSURE OF SULPHUR

#### Viscosity



#### CHANGE OF VISCOSITY OF LIQUID SULPHUR

**Weight per Cubic Foot**—Broken sulfur in bins, 85 lbs. per cubic foot.

**Angle of Repose**—35 Degrees

# UNION CHEMICAL COMPANY

Industrial Chemicals for All Purposes

27 Haymarket Square

BOSTON, MASS.

Highest Quality



Personal Service

NEW ENGLAND AGENTS FOR  
Robinson & Stevens

Hercules Powder Co., Naval Stores Division

Strahl & Pitsch

## PRODUCTS

### Naval Stores

Rosin  
Turpentine  
Pine Oils  
Pitch  
Rosin Oils  
Pine Tar  
Crude Turpentine  
Gum Thus

### Blacks

Carbon  
Bone  
Drop  
Ivory  
Lamp

### Red Oxide of Iron All Grades

### Heavy Chemicals

Nitric Acid  
Muriatic Acid  
Sulphuric Acid  
Soda Ash

### Mineral Rubber Gilsonite

### Waxes

Paraffin  
Carnauba  
Beeswax  
Ceresine  
Spermaceti  
Candelilla  
Palm  
Montan  
Ozokerite

### Aniline Colors

Acid  
Basic  
Direct  
Sulphur

### Mineral Fillers

Aluminum Flake  
Asbestine  
Barytes  
Whiting  
Zinc Oxide  
Lithopone

### Glues

Bone  
Dry Hide

## GUM ROSIN

We carry all grades of Rosin for use in soap, paper, paint and varnish, waterproofing compounds and specialties.

### YARYAN "F" WOOD ROSIN

More uniform in quality than gum rosin, and absolutely free from dirt and foreign matter. The color is a clear cherry red, somewhat darker than the corresponding grade of gum rosin.

In practically every case where "F" gum rosin is used, Yaryan "F" may be used with a distinct saving in the cost, due to its cleanness and uniformity.

Mill tests have demonstrated that it is very superior for sizing the darker grades of papers, fiber board, etc.

### PURE GUM SPIRITS OF TURPENTINE

We are agents for large producers and carry stocks at all times.

### YARYAN STEAM DISTILLED TURPENTINE

This Turpentine conforms to all standard specifications. Due to chemically controlled production meth-

ods, it runs absolutely uniform and will meet every industrial requirement.

## PINE TREE PRODUCTS

A full line of Rosin Oils, Tar Oils, Tar, Venice Turpentine, Crude Turpentine, Pitches, etc.

## BLACKS

High grade pure natural gas Carbon Black for use in the manufacture of rubber, paper, printing ink, artificial leather and paint and varnish. We have several grades and are prepared to offer one most suitable for your use.

We call special attention to our Compressed Carbon Black for use by rubber manufacturers, it being compressed to such an extent that it does not fly around, yet distributes easily and thoroughly throughout the compound.

## ANILINE COLORS

We have a full line of these products for use by all industries and are prepared to furnish formulas for any desired shades.

## WAXES

We have a complete line of Mineral, Animal, and Vegetable Waxes of the highest grades for use in waterproofing compounds, polishes, shoe dressings, and specialties.

## HEAVY CHEMICALS

We have direct connections with producers of Acids, Soda Ash, Caustic Soda, and other industrial chemicals for all purposes.

## MINERAL FILLERS

We offer to the rubber and paper trade a complete line of Mineral Fillers of the highest grade.

## GLUES

Our Glues are produced by one of the oldest and most reliable glue manufacturers in the world and we can supply the highest grade bone and dry hide glues and glue compounds.

## SERVICE

We maintain a technical service department, which is at the disposal of our customers at all times and in addition we offer our services in locating chemicals which are seldom found on the regular markets.

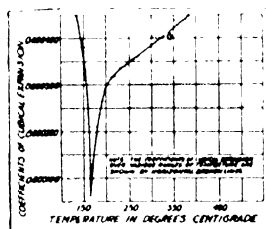
**Electrical Conductivity**—(Measured on a 1 cm. cube, as reciprocal value of Resistivity in ohms)

TEMPERATURE		CONDUCTIVITY
Cent.	Fahr.	
22°	72°	1.5 × 10 <sup>-12</sup>
69°	156°	0.24 × 10 <sup>-12</sup>
115°	239°	0.100 × 10 <sup>-12</sup>
130°	266°	0.5 × 10 <sup>-12</sup>
430°	806°	0.1 × 10 <sup>-12</sup>

Compare		CONDUCTIVITY
Porcelain	Fahr.	
Mica	0.1	10 <sup>-12</sup>
Fluorite	1.0	10 <sup>-12</sup>

It requires 20,000 volts AC to produce a disruptive discharge through  $\frac{1}{4}$  inch of molten sulfur while good transformer oil requires 30,000 volts and air is pierced at 6000 volts.

#### Expansion— Cubical



#### COEFFICIENTS OF CUBICAL EXPANSION

dilute acids on polysulfides. Generally called amorphous, but shown by Smith and Brownlee to be crystalline.

There are several other modifications of crystalline sulfur of scientific interest but not of general importance.

#### Liquid

At 113°C. or 235°F Sp. gr. 1.81

Contains: Sulfur (Liquid soluble) S<sub>L</sub>, Sulfur (Liquid insoluble, or amorphous) S<sub>A</sub>.

The proportion of S<sub>A</sub> to S<sub>L</sub> increases with the temperature.

#### Amorphous—S<sub>A</sub>

Solid—Sp. gr. 1.89

Plastic Sulfur—Formed by heating sulfur above viscous stage, 162°C. or 324°F and cooling quickly Sp. gr. 1.88

Elastic Sulfur—Formed by heating sulfur above 400°C. or 752°F and pouring in thin stream into liquid air. Its elastic properties are soon lost.

**Heat Conductivity**—(Measured as the number of gram calories transmitted in one second through a plate 1 cm thick and having surfaces 1 sq. cm. in area when opposite faces differ in temperature by 1°C.)

20°–100°C. or 68°–212°F. 0.0006—Gm. Calories

#### Heat of Combustion

	G. cal. per K. Sulfur	B. T. U. per lb.
S + O <sub>2</sub> to SO <sub>2</sub> . . . . .	2200	3960
S to H <sub>2</sub> SO <sub>4</sub> (dilute) . . . . .	2450	4410
S to H <sub>2</sub> SO <sub>4</sub> (dilute) . . . . .	4450	8010

#### Heat of Fusion

	G. cal. per K.	B. T. U. per lb.
Rhombic at 100°C. or 212°F. . . . .	11.9	26.8
Monoclinic at 100°C. or 212°F. . . . .	11.5	20.7
To form pure liquid Sulfur (S <sub>L</sub> ) . . . . .	14.5	26.1
From Rhombic . . . . .	11.1	20.9

#### Heat of Solution in Carbon Disulfide

	G. cal. per K.	B. T. U. per lb.
Dilute solution . . . . .	-11.89	-21.4
Saturated solution . . . . .	-11.55	-20.9

#### Heat of Vaporization

Temperature	G. cal. per K.	B. T. U. per lb.
Cent. Fahr.		
114.6° 832.3°	70 (approx.)	126 (approx.)

#### Ignition Temperature—248°C. or 478°F

International Atomic Weight 1920 = 32.06.

#### Melting-point

	Temperature	
Rhombic . . . . .	112.4° 235°	
Monoclinic . . . . .	119.25° 246.7°	
Natural Freezing point S <sub>L</sub> and S <sub>A</sub> in equilibrium (96.3% S <sub>L</sub> , 3.7% S <sub>A</sub> ) 110.2°C. or 230.4°F.		

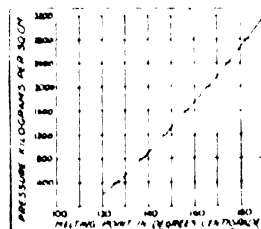
#### Specific Heat

	Temperature	Sp. Ht.
	Cent. Fahr.	
Rhombic . . . . .	0°–95° 32°–203°	0.1751
Liquid . . . . .	160°–201° 320°–393°	0.279
	201°–233° 393°–451°	0.281

#### Specific Gravity

Amorphous	1.956
Yellow	2.046
Monoclinic	1.958
Rhombic	2.06

#### Melting-point change



#### CHANGE OF MELTING-POINT WITH PRESSURE

#### Solubilities

Solvent	Temperature		Solubility g. in 100 g. Solution
	Cent.	Fahr.	
Amyl Alcohol	9.4°	20.3°	1.5
	110	230	2.1
Aniline	89.5	193.1	8.3
Benzol	110	266	46.2
Carbon Disulfide	25	77	2.1
	70	158	8.0
Carbon Tetrachloride	10	50	10.5
	14	57	13.5
Chloroform	0	32	18
Coal tar Oil	20	68	29.5
	50	122	59
	100	212	92
Carbon Tetrachloride	25	77	0.86
Chloroform	12	54	1.2
Coal tar Oil	15	59	2
Sp. Gr. 0.87 . . . . .	100	212	13
Sp. Gr. 1.02 . . . . .	15	59	0.5
Ethyl Ether . . . . .	110	230	5.5
Linseed Oil . . . . .	21.5	70.7	0.97
	15	59	0.4
Olive Oil (Sp. Gr. 0.885) . . . . .	160	320	9.0
	15	59	2.2
Sulfur Chloride . . . . .	130	266	39
	0	32	11
	55.2	131.4	43
	86	186.8	89
Phenol . . . . .	17.5	63.5	26.7
Toluol . . . . .	23	73.4	1.48
Turpentine Oil of . . . . .	16	60.8	1.33
Boiling point . . . . .			13.9

#### Surface Tension

Temperature	Surface Tension
Cent. Fahr.	Mg. per mm.
120° 248°	5.7
131° 267.8°	6.12
146° 294.8°	6.05
195° 383°	6.62

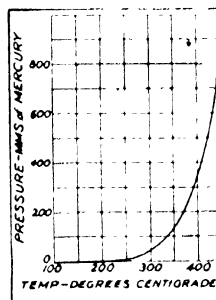
**Tensile Strength** 200 pounds per square inch (approximate)

**Vapor Density** At B. P. corresponds approximately to formula S<sub>8</sub>. At 1000°C. or 1832°F. corresponds approximately to formula S<sub>2</sub>.

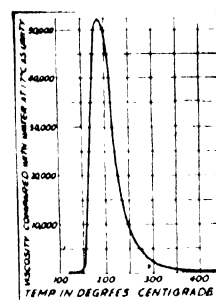
#### Transition Temperature

MONOCLINIC		RHOMBIC	
Pressure		Temperature	
Kg. cm <sup>2</sup>	Hrs. in °	Cent.	Fahr.
10.6	15	98°	204.8°
123	175	100.1°	212.2°
634	907	120°	248°
1350	1920	150°	302°

#### Vapor Pressure



#### VAPOR PRESSURE OF SULPHUR



#### CHANGE OF VISCOSITY OF LIQUID SULPHUR

**Weight per Cubic Foot**—Broken sulfur in bins, 85 lbs. per cubic foot.

**Angle of Repose**—35 Degrees

# U. S. INDUSTRIAL ALCOHOL CO.

EXECUTIVE OFFICES

27 William Street

NEW YORK, N. Y.

## PRODUCTS

**Ethyl Alcohol** (U. S. P., U. S. Government specifications and special grades for special uses)

**Completely Denatured Alcohol** (all formulas authorized by the U. S. Internal Revenue Bureau)

**"Pyro" Alcohol**

**Specially Denatured Alcohol** (all formulas authorized by the U. S. Internal Revenue Bureau).

**C. P. Methanol**

**Pure Methanol**

**Commercial Acetone**

**"Calcitone"**

**Methyl Acetone**

**95% and 97% Refined Wood Alcohol**

**Denaturing Grades of Wood Alcohol**

## PRODUCT SPECIFICATIONS

**ETHYL ALCOHOL, U. S. P.**

**ETHYL ALCOHOL, U. S. Government Specifications**

**ETHYL ALCOHOL, Special Grades for Special Uses**

**COMPLETELY DENATURED ALCOHOL**

Completely denatured alcohol is ethyl alcohol rendered unfit for beverage purposes by the addition of material prescribed by the U. S. Internal Revenue Bureau. Alcohol so denatured may be used without restrictions or regulations except as to marking of containers and is not subject to tax.

Completely denatured alcohol formulas are as follows. Because of the confusion of **Methyl** and **Ethyl Alcohols** among laymen and the dangers involved we have decided to use the word alcohol only in connection with the ethyl and denatured alcohols and to indicate the grades of methyl alcohol by the **Methanol**.

### Formula No. 1

This formula, which consisted of 100 parts of ethyl alcohol, 10 parts of methanol and  $\frac{1}{2}$  part benzene, has been suspended by the U. S. Bureau of Internal Revenue.

### Formula No. 2

100 gal. ethyl alcohol  
2 gal. approved wood alcohol  
 $\frac{1}{2}$  gal. approved pyridine

### Formula No. 3

100 gal. ethyl alcohol  
5 gal. sulphuric ether  
2 gal. approved benzene  
1 gal. approved pyridine

### Formula No. 4

100 gal. ethyl alcohol  
25 gal. approved benzol  
0.5 gal. approved nitrobenzol  
0.2 gal. pine oil (steam distilled)

### Formula No. 5

100 gal. ethyl alcohol  
2 gal. approved wood alcohol  
 $\frac{1}{4}$  gal. approved pyridine bases  
 $\frac{1}{2}$  gal. approved benzene

### Formula No. 6

100 gal. ethyl alcohol  
2 gal. approved benzol  
 $\frac{1}{4}$  gal. approved pyridine bases  
 $\frac{1}{2}$  gal. approved benzene (kerosene)

## "PYRO" ALCOHOL

This is a grade of denatured alcohol which has been denatured according to one of the above formulas for completely denatured alcohol. In addition to passing Government inspection, the manufacture of this product has been very carefully controlled by skilled chemists resulting in a uniform product of very high quality.

## SPECIALLY DENATURED ALCOHOL

Specially denatured alcohol is ethyl alcohol of 190° proof (95%) which has been partially denatured by the addition of materials prescribed by the U. S. Internal Revenue Bureau. Alcohol so denatured may be used for the purposes authorized by and under the supervision of the U. S. Internal Revenue Bureau. Such alcohol is not subject to tax but must be used under permit and bond. Details of the procedure necessary in order to obtain authorization for use, permit and bond, etc., will be furnished by us upon request.

### Formula No. 1

100 gal. ethyl alcohol

5 gal. approved methanol

### Authorized Uses

Acetaldehyde	Camphor, synthetic
Acetphenetidine	Cements
Acetic ether	Dental alloy
Aconite	Dandelion and digitalis
Adeps. lane	(Resin of, solid and powdered extracts of)
Alkaloids and alkaloidal salts	Disinfectant germicide
Alterin	Door checks
Alon	Dyestuffs
Antipyrine	Dimethylglyoxime
Apocynin	Dinitrotoluene
Arbutin	Digestive ferments
Asclepiadin	Diethylaniline
Avenin	Ethyl acetate
Artificial flowers	Ethyl propionate
Ammunition	Ethyl butyrate
Atophan	Essential oil orris
Aspirin	Ethyl chloride
Acetanilide	Embalming fluid
Artificial feathers	Eosine
Baptisin	Ethyl bromide
Barometer and thermometer tubes	Ether
Benzoic acid	Ethylaniline
Benzaldehyde	Enamel
Beta-naphthol	Extracting glycerine from distillery slop
Beta-naphthol benzoate	Filaments for incandescent lamps
Brushes	Formaldazone
Benzidine	Fertilizers
Beta-naphthol salicylate	Fulminate of mercury
Benzyl cyanide	Formaldehyde
Benzoin	Gaduol
Chelonin	Gelatine capsules
Cimicifugin	Gentian (solid extract)
Collodion	Glycerophosphates
Collodion corn remedy	Guaiaicol
Concentrations (non-liquid)	Guaiaicol carbonate
Confectioners' colors	Gum and pyroxilin solutions
Coumarin	Gallocyanine
Cutlery	Gas mantles
Cocoa butter	Hats
Composition billiard and pocket balls	Heliotropin
Chloroform	Hydrastis (alkaloid of)
Compasses	Hexachlorobenzol
Creosote carbonate	
Colors and bronze powders	
Chloral hydrate	

*Continued on Next Page*

Inks	Refining precious metals
Indulin and iriscin	Resin of scammony
Imitation leather	Resorcin
Isinglass	
Imitation ivory goods	Salel
	Santonin and strychnine
Jalapin (non liquid concen- tration oil)	Solid extracts
Jewelry and watches	Soaps (transparent and liquid)
Japans	Shellac varnish
	Shoe polish
Lacquers, pastes and var- nishes from soluble cotton	Silverware and bronze
Leather substitutes	Smokeless powder
Leather-goods finish	Surgical ligatures
Lacquers	Soldering flux
Liquor cresolis compound	Sodium benzoate
	Sulphonic acid and paraffine
Mandrake (powdered and solid extract oil)	Sulphic aldehyde
Mirrors	Solution and solvent of nitro- cellulose
Moldings and picture frames	Solidified alcohol
Monobromated camphor	Salephen
Moth repellent	Saponin
Mica insulators	Sulphic acid
Mucilage, paste, and glue	Saccharine
Motor fuel	Shellac thinner
	Stains
Non-scatterable glass	Sterilizing solution for corks
Nitroso-beta-naphthol	Silk fabrics
	Synthetic mustard oil
Ortho-toluolsulphamide	Shampoo, liquid
Oils, greases, lubricants, and soluble thread-cutting oils	Shampoo, jelly
Oleo-resins	Stencil paper
	Tannic acid
Paints	Tintol and bottle caps
Phenolphthalein	Terpin hydrate
Phytolacin (concentration oil)	Textile cleansing soap
Photographic dry plates and films	Toluidine
Print paper and enlargements	Transparent paper
Postal-card colors	Transparent soap for water- proofing cement
Polish preparations for met- als and furniture	Trinitrotoluol
Pepsin and similar products	Iodobromine
Potassium hydroxide	Thermostatic devices
Podophyllin resin and similar products	Varnish remover
Powdered drugs and extracts	Viburnum (concentration)
Photographic engravings	Water colors
Phenylcinchoninic acid	Wood finish
Pyroxylene cements	Wood fat
	Washing lenses
	Wood filler
	Watches

**Formula No. 2**

100 gal. ethyl alcohol  
7 lb. camphor  
5 gal. methanol (refined)

**Authorized Uses:** Pyraline and similar products

**Formula No. 2a**

100 gal. ethyl alcohol  
2 gal. approved methanol  
2 gal. benzol

**Authorized Uses:** Celluloid, pyraline and similar products

**Formula No. 2b**

100 gal. ethyl alcohol  
 $\frac{1}{2}$  gal. benzol

**Authorized Uses:** Acetic ether, acetphenetidine (condi-  
tional), dyes, diethyl barbituric acid (barbital), ethyl sulphate  
(for use in manufacture of acetphenetidine); phenacetine;  
pyroxylene plastics, ketone, Michler's; sulphuric ether (in con-  
nection with the production of powder), synthetic camphor,  
trinitrotoluol, viscoid, white petroleum oils; ethyl sulphate

**Formula No. 3**

100 gal. ethyl alcohol  
 $6\frac{1}{2}$  gal. following mixture: 5 gal. methanol (refined), 1  
gal. castor oil,  $\frac{1}{2}$  gal. of 36 deg. B $\epsilon$  caustic soda lye

**Authorized Uses:** Transparent soap; shampoo; shampoo  
jelly.

**Formula No. 3a**

100 gal. ethyl alcohol  
5 gal. methanol (refined)

**Authorized Uses:** Cutting oils, shampoo, shampoo jelly,  
transparent soap

**Formula No. 3b**

100 gal. ethyl alcohol  
1 gal. liquid pine tar

**Authorized Uses:** Liquid soap, shampoo, shampoo jelly

**Formula No. 4**

100 gal. ethyl alcohol  
1 gal. following solution: 5 gal. aqueous solution con-  
taining 30 per cent nicotine, 0.4 lb. acid yellow dye  
(fast yellow Y), 0.4 lb. tetrazo brilliant blue 12B,  
conc., water to make 100 gal.

100 gal. ethyl alcohol

1 gal. following solution: 5 gal. aqueous solution con-  
taining 30 per cent nicotine, 3.6 oz. more or less, of  
methylene blue, water to make 100 gal.  
(This is an alternative for formula 4 above)

**Authorized Uses:** Cigars, cigarettes, smoking, chewing to-  
bacco, deodorants

**Formula No. 5**

100 gal. ethyl alcohol  
65 lb. sulphuric ether  
3 lb. cadmium iodide  
3 lb. ammonium iodide

**Authorized Uses:** Photo enlargements, photoprints, photo-  
engravings, photographic collodion

**Formula No. 6**

100 gal. ethyl alcohol  
3 gal. methanol (refined)  
 $\frac{1}{2}$  gal. pyridine bases

**Authorized Use:** Fulminate of mercury

**Formula No. 6a**

100 gal. ethyl alcohol  
15 gal. condensed fumes, recovered in the process of  
manufacture (Fulminate of mercury)

**Authorized Use:** Fulminate of mercury

**Formula No. 6b**

100 gal. ethyl alcohol  
 $\frac{1}{2}$  gal. pyridine bases

**Authorized Uses:** Acetphenetidine, chloral hydrate, di-  
chloroethane, ethyl acetate, ethyl butyrate, ethyl chloride,  
para-fulminate of mercury, para-phenetidine, acetic ether,  
ethyl bromide

**Formula No. 7**

Revoked (formula 1 substituted)

**Authorized Use:** Revoked

**Formula No. 8**

100 gal. ethyl alcohol  
1 gal. pyridine bases  
1 gal. benzol

**Authorized Uses:** Ethyl chloride, fine chemicals; sulphone-  
methane, dyes

**Formula No. 9**

100 gal. ethyl alcohol  
10 gal. acetone  
2 gal. petroleum naphtha

**Authorized Uses:** Monobromated camphor, purification of  
rubber, santonin, strychnine, tannic acid

**Formula No. 10**

100 gal. ethyl alcohol  
2 gal. approved methanol  
2 gal. benzol

**Authorized Uses:** Ethyl acetate (conditional), lacquers,  
pastes and varnishes from soluble cotton

**Formula No. 11**

100 gal. ethyl alcohol  
100 lb. sulphuric ether  
10 lb. cadmium iodide

**Authorized Uses:** Photographic collodion, photo-engrav-  
ing, photoprints

**Formula No. 12**

100 gal. ethyl alcohol  
1 gal. pyridine bases  
2 gal. benzol

**Authorized Uses:** Imitation leather (see also formula 12a);  
soluble cotton.

*Continued on Next Page*

**Formula No. 12a**

100 gal ethyl alcohol  
5 gal benzol

**Authorized Uses:** Acetphenetidine, barbital, hydr zoanisol, imitation leather, milk protein, para-nitrophenol, refining potassium and sodium hydrates, saponification of the waxes of acid fast bacteria, smokeless powder, terpin hydrate, trinitrotoluol, benzoic acid ethyl ester, dye intermediates, imitation rubber

**Formula No. 13**

100 gal ethyl alcohol  
5 gal sulphuric acid  
5 gal sulphuric ether

**Authorized Use:** Sulphuric ether (See also formula 13a)

**Formula No. 13a**

100 gal ethyl alcohol  
10 gal sulphuric ether

**Authorized Uses:** Celery oil, certified food colors, dry extracts for food products, ethereal oil, protargentum, sodium ethyl sulphate, sulphuric ether

**Formula No. 14**

100 gal ethyl alcohol  
5 gal methanol (refined)  
10 lb anhydrous zinc chloride

**Authorized Use:** Ethyl chloride (See also formulas 1 and 8)

**Formula No. 15**

100 gal ethyl alcohol  
3 gal sulphuric acid  
1 gal ketosene

**Authorized Uses:** Ethyl bromide, ethyl chloride, nitrous ether, pure acetic ether

**Formula No. 16**

100 gal ethyl alcohol  
5 gal methanol (refined)  
2 gal benzol

**Authorized Uses:** Beta-naphthol, by-products from distillery slop, glycerophosphates, lacquers for food containers, phenylacetic acid, acetanilide, acid salicylic, acetphenetidine ammonium, benzonaphthol, beta naphthol benzoate, codeine, diacetylmorphine, ethyl morphine, homatropine, morphine salicylate, cocaine, sodium, strontium, salol (See also formula 1)

**Formula No. 17**

100 gal ethyl alcohol  
5.100 gal (6½ fluid oz) animal oil (Dippel's oil)

**Authorized Uses:** Acetphenetidine, chloral hydrate, dichlorethane, ethyl acetate, ethyl chloride, ethylene gas, para-phenetidine

**Formula No. 18**

100 gal ethyl alcohol  
100 gal vinegar (not less than 9 per cent acetic acid)

**Authorized Uses:** Acetate of lime, acetone; vinegar

**Formula No. 19**

100 gal ethyl alcohol  
100 gal ethyl ether

**Authorized Uses:** Artificial silk, backing of films, by-products from distillery slop (See also formula 16) Colloidion, ethyl acetate, iodizers, solvent for nitrocellulose, photofilms, photo engravings

**Formula No. 19a**

100 gal ethyl alcohol  
not less than 100 gal ethyl ether or more than 150 gal ethyl ether (Sp gr at 60°F = 0.728)

**Authorized Uses:** Artificial silk in connection with colloidion (conditional)

**Formula No. 20**

100 gal ethyl alcohol  
5 gal crude chloroform

**Authorized Use:** Chloroform (conditional).

**Formula No. 21**

100 gal ethyl alcohol  
100 gal solution containing not less than 4½ per cent acetic acid

**Authorized Use:** Acetate of lime (conditional)

**Formula No. 22**

100 gal ethyl alcohol  
10 gal solution of formaldehyde

**Authorized Use:** For preserving formaldehyde, U. S. P

**Formula No. 23**

100 gal ethyl alcohol  
10 gal acetone  
2 gal benzol

**Authorized Use:** Liniment for external use only

**Formula No. 23a**

100 gal ethyl alcohol  
10 gal acetone, U. S. P

**Authorized Uses:** Liniments and lotions for external purposes

**Formula No. 23b**

100 gal ethyl alcohol  
15 lb camphor, U. S. P  
2 lb menthol crystals, U. S. P  
3 lb carbolic acid, U. S. P

**Authorized Uses:** Lotions for external purposes only.

**Formula No. 23c**

100 gal ethyl alcohol  
10 lb carbolic acid, U. S. P  
15 lb resorcinol, U. S. P  
5 lb oil of wintergreen, U. S. P or methyl salicylate, U. S. P

**Authorized Uses:** Lotions for external purposes only.

**Formula No. 24**

100 gal ethyl alcohol  
29 gal sulphuric acid

**Authorized Uses:** Phenacetin, ethyl acetate (conditional), ethyl butyrate, ethyl propionate, ethyl valerate

**Formula No. 25**

100 gal ethyl alcohol  
20 lbs iodine  
15 lbs potassium iodide, U. S. P

**Authorized Uses:** Tincture of iodine, U. S. P; Tr. iod. for-tor, N. F.; tr. iodine, Churchill's, tr. iodine, 3½%

**Formula No. 26**

100 gal ethyl alcohol  
5 gal aniline oil

**Authorized Uses:** Ethylaniline and diethylaniline

**Formula No. 27**

100 gal ethyl alcohol  
1 gal oil rosemary  
30 lb camphor

**Authorized Uses:** Soap liniment, U. S. P, chloroform liniment, U. S. P, liquid and green soap, in accordance with U. S. P except as to content of camphor and oil of rosemary

**Formula No. 27a**

100 gal ethyl alcohol  
35 lb camphor, U. S. P  
1 gal oil cloves, U. S. P

**Authorized Uses:** Same as for Formula 27.

**Formula No. 28**

100 gal ethyl alcohol  
10 gal benzol

**Authorized Use:** Motor fuel (conditional).

**Formula No. 29**

100 gal ethyl alcohol  
5 gal alcoholic solution acetaldehyde

**Authorized Uses:** Aldehydes (conditional); glacial acetic acid (conditional).

*Continued on Next Page*

**Formula No. 30**

100 gal ethyl alcohol  
10 gal methanol (refined)

**Authorized Uses:** Chemical and physical laboratory purposes, only in accordance with the provision of I. D. 2793 (no recovery for re-use), photo dry plates, manufacturing vegetable oils, varnish, white petroleum oils (conditional)

**Formula No. 31**

100 gal ethyl alcohol  
100 lb soap  
100 lb glycerine, U. S. P.

**Authorized Use:** Tooth paste

**Formula No. 31a**

100 gal ethyl alcohol  
100 lb glycerine  
20 lb hard soap

**Authorized Use:** Tooth paste.

**Formula No. 31b**

100 gal ethyl alcohol  
5½ gal oil peppermint  
1¼ gal eucalyptol  
4 lb menthol crystals

**Authorized Use:** Tooth paste

**Formula No. 31c \***

100 gal ethyl alcohol  
33 lb citric acid, U. S. P.  
33 lb menthol, U. S. P.

**Authorized Uses:** Tooth paste

**Formula No. 32**

100 gal ethyl alcohol  
5 gal sulphuric ether

**Authorized Use:** Ethylene (conditional)

**Formula No. 33**

(33) 100 gal ethyl alcohol  
30 lb methyl violet

**Authorized Use:** Meat branding inks (conditional).

**Formula No. 34**

100 gal ethyl alcohol  
5 gal tetrachloroethane

**Authorized Uses:** Artificial silk

**Formula No. 35**

100 gal ethyl alcohol  
35 gal ethyl acetate

**Authorized Uses:** Acet-para-aminophenol, salol

**Formula No. 36**

100 gal ethyl alcohol  
3 gal stronger ammonia water, U. S. P.

**Authorized Uses:** Shaving cream

**Formula No. 37**

100 gal ethyl alcohol  
45 oz eucalyptol, U. S. P.  
30 oz thymol, U. S. P.  
20 oz menthol, U. S. P.

**Authorized Uses:** Antiseptic solutions for external purposes

**Formula No. 38**

100 gal ethyl alcohol  
10 lb oil of wintergreen, U. S. P., or methyl salicylate, U. S. P., or oil of cassia, U. S. P., or oil of cloves, U. S. P., or oil of peppermint  
5 gal of a water solution of 60 oz zinc chloride, U. S. P.

**Authorized Uses:** Mouth washes and dentifrices

**Formula No. 38a**

100 gal ethyl alcohol  
5 oz menthol crystals, U. S. P.  
9 oz emetine hydrochloride, U. S. P.  
16 lb benzoic acid, U. S. P.

**Authorized Uses:** Liquid dentifrices.

**Formula No. 39**

100 gal ethyl alcohol  
9 lb (Ayon) sodium salicylate, U. S. P.  
1½ gal fluid extract quassia, U. S. P.  
1 gal acetone, U. S. P.

**Authorized Uses:** Barber's supply preparations

**Formula No. 39a**

100 gal ethyl alcohol  
60 oz (Ayon) of any one of the following U. S. P. alkaloids or salts, quinine, quinine bisulphate, quinine hydrochloride, cinchonidine, cinchonidine sulphate  
1 gal acetone, U. S. P.

**Authorized Uses:** Barber's supply preparations

**Formula No. 40**

100 gal ethyl alcohol  
3 oz (Ayon) bromine sulphate  
½ gal acetone, U. S. P.

**Authorized Uses:** Perfumes and high grade toilet preparations

The types and quality of denaturing materials used in the formulas given are controlled by the U. S. Internal Revenue Bureau, and the details as to their specifications will be supplied upon request.

## THE FOLLOWING PRODUCTS ARE MANUFACTURED AT OUR PLANT IN BUFFALO, NEW YORK.

**C. P. Methanol**

Free from Acetone

**Pure Methanol**

Practically free from water, guaranteed to contain less than 0.1% acetone, specific gravity 0.795. Used in the manufacture of formaldehyde, dimethylamine, methyl salicylate, etc.

**Commercial Acetone**

80-90% true acetone, odor, specific gravity, etc., practically the same as pure acetone

**"Calcitone"**

Free from water, containing 50-60% methyl acetate, about 20% acetone. A fine solvent for cellulose acetate

**Methyl Acetate**

Free from water, guaranteed to contain 70-80% combined acetone and methyl acetate

**95-97% Refined Wood Alcohol****Denaturing Grades of Wood Alcohol**

For all countries

Our Buffalo plant is the result of a great many years spent in research and refinement in methods and apparatus for the production of those products derived from the destructive distillation of wood.

Because of the confusion of **Methyl** and **Ethyl Alcohols** among laymen and the dangers involved we have decided to use the word alcohol only in connection with the ethyl and denatured alcohols and to indicate the grades of methyl alcohol by the term Methanol.

Careful consideration has been given to the separation of acetone from the methanol and attention is called to the two grades indicated as C. P. Methanol and Pure Methanol. Particular attention is given to requests for denaturing grades of methanol which may be required by different countries.

# U. S. INDUSTRIAL CHEMICAL CO.



EXECUTIVE OFFICES  
27 William Street  
NEW YORK, N. Y.



## PRODUCTS

Acetic Ether  
Ammonia Salts  
Amyl Acetate  
Amyl Alcohol  
Carbon Dioxide  
Denatured Alcohol  
Ether  
Ethyl Acetate  
Ethyl Acetoacetate (Acetoacetic Ester)  
Ethyl Alcohol  
Ethylene  
Fertilizers, Mixed  
Iodine  
Iodine, Tincture of  
Isobutyl Alcohol  
Fusel Oil  
Methyl Acetate  
Methyl Alcohol  
Potash Materials  
Potassium Iodide  
Propyl Alcohol

## PRODUCT SPECIFICATIONS

### ACETIC ETHER, ANHYDROUS

Weight: 7.5 lb. per gallon at 60°F  
Saponification: 99%  
Acidity (as Acetic): Not more than 0.01%  
Containers: Tank cars—8000 gallons  
50 or 100-gallon steel drums

### ALCOHOL, AMYL, COMMERCIAL

Specific Gravity: 0.813-0.815  
Boiling-range: 126°-132°C  
Weight: 6.78 lb. per gallon at 60°F  
Containers: 50 and 100-gallon iron drums

### ALCOHOL, AMYL, REFINED

Weight: 6.78 lb. per gallon  
Specific Gravity: 0.813-0.815  
Boiling-range: 128°-132°C  
Containers: 5 or 10-gallon pressed steel tin-lined drums  
1/2-liter bottles, 36 bottles to the case

### ALCOHOL, ETHYL, PURE 96%

Weight: 6.763 lb. per gallon at 60°F  
Containers: 50-gallon steel tin-lined drums  
5 or 10-gallon pressed steel tin-lined drums  
1/2-liter bottles, 36 bottles to the case

### ALCOHOL, ETHYL, ABSOLUTE

C.H.OH: 99.7 to 100%  
Weight: 6.62 lb. per gallon at 60°F  
Containers: Steel drums tin-lined, 5, 10 and 50 gallons

### ALCOHOL, ETHYL, ABSOLUTE, 99.9%

Weight: 6.616 lb. per gallon at 60°F  
Containers: 50 gallon steel tin-lined drums  
5 or 10-gallon pressed steel tin-lined drums  
1/2-liter bottles, 36 bottles to the case

### ALCOHOL, ETHYL, ABSOLUTE, DENATURED

Absolute Alcohol may be obtained for use in manufacturing processes, tax-free, when denatured according to formulas authorized and approved by the U. S. Internal Revenue Bureau.

### ALCOHOL, ISOBUTYL

Weight: 6.72 lb. per gallon  
Boiling-range: 101°-109°C  
Containers: 50 or 100-gallon steel drums

### ALCOHOL, ISOBUTYL—REFINED

Weight: 6.72 lb. per gallon  
Specific Gravity: 0.807  
Boiling-range: 106°-108°C  
Containers: 5 or 10-gallon pressed steel tin-lined drums  
1/2-liter bottles, 36 bottles to the case

### ALCOHOL, METHYL, ABSOLUTE

C.H.OH: 99.5 to 100%  
Weight: 6.633 lb. per gallon at 60°F  
Acetone: None  
Containers: 5 and 10-gallon pressed steel tin-lined drums  
50 gallon steel drums  
1/2-liter bottles, 36 bottles to the case

### ALCOHOL, NORMAL PROPYL—COMMERCIAL

Boiling-range: 90°-101°C  
Weight: 6.75 lb. per gallon at 60°F  
Containers: 50 and 100-gallon iron drums

### ALCOHOL, NORMAL PROPYL, REFINED

Weight: 6.74 lb. per gallon  
Specific Gravity: 0.809  
Boiling-range: 96°-98°C  
Containers: 5 or 10-gallon pressed steel tin-lined drums  
1/2-liter bottles, 36 bottles to the case

### AMMONIA SALTS

Derived from distillery waste  
Sulfate of Ammonia  
A mixture of Ammonia and Potash Salts  
Shipped in 200-lb. bags

### AMYL ACETATE, COMMERCIAL

Weight: 7.17 lb. per gallon  
Saponification (as Amyl Acetate): 85%  
Containers: Tank cars—8000 gallons  
50 or 100-gallon steel drums

### AMYL ACETATE, REFINED

Weight: 7.30 lb. per gallon  
Ester (calculated as Amyl Acetate): 99%  
Acidity (as Acetic): Not over 0.01%  
Specific Gravity: 0.876-0.878  
Containers: 5 and 10-gallon pressed steel tin-lined drums  
1/2-liter bottles, 36 bottles to the case

### CARBON DIOXIDE

CO<sub>2</sub>: Not less than 99.8%  
Containers: Steel cylinders (Gross weight about 15 lb.  
Net weight 3 lb. (about 25 cu. ft.))

### ETHER FOR ANESTHESIA

Derived from Ethyl Alcohol  
Purified especially for Anesthesia  
Weight: 6.01 lb. per gallon at 60°F

Aldehydes	.....none
Peroxides	.....none
Sulfur Acids	.....none
Organic Acids	.....none
Oxidizable Impurities (Permanganate Test)	—None
Residue on Evaporation	.....not weighable

Containers: One-pound cans, 12 cans to the corrugated paper ICC case  
Quarter-pound cans, 24 cans to the corrugated paper ICC case

*Continued on Next Page*



**ETHER, COMMERCIAL**Not less than 96% (C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>O**Weight:** 6.0 lb. per gallon at 60°F**Containers:** 50-gallon tin lined drums**ETHER, ETHYL, ABSOLUTE**

Derived from Ethyl Alcohol

**Weight:** 5.996 lb. per gallon at 60°F

Distilled over sodium

Specially purified for use in Grignard reaction

**Containers:** Five-gallon pressed steel lined drums

One-pound cans, 12 cans to the corrugated paper ICC case

**ETHER, ETHYL, U. S. P.**

Derived from Ethyl Alcohol

**Weight:** 6.01 lb. per gallon at 60°F

Conforms to requirements of U. S. Pharmacopoeia, IX

**Containers:** 5, 10 and 50-gallon pressed steel lined drums

One-pound cans, 12 cans to the corrugated paper ICC case

**ETHYL ACETATE, ANHYDROUS****Weight:** 7.5 lb. per gallon at 60°F**Specific Gravity:** 0.905 to 0.907**Boiling-point:** 76°-78°C**Ester:** 99.7-100%**Containers:** 5 or 10-gallon pressed steel lined drums

1/2-liter bottles, 36 bottles to the case

**ETHYL ACETATE, COMMERCIAL****Weight:** 7.44 lb. per gallon at 60°F**Saponification (Ester):** Not less than 85%**Acidity (calc. as Acetic):** Not more than 0.01%**Water:** None**Color:** Water white**Containers:** Tank cars—8000 gallons

50 or 100-gallon steel drums

**ETHYL ACETOACETATE, REFINED****Specific Gravity:** 1.032 to 1.035**Boiling-point at 20 mm.:** 79°-84°C**Weight:** 8.6 lb. per gallon at 60°F**Containers:** 1/2 liter bottles, 36 bottles to the case

2 and 5-gallon glass carboys

**ETHYL ACETOACETATE, COMMERCIAL****Weight:** 8.6 lb. per gallon at 60°F**Specific Gravity:** 1.030 to 1.035**Boiling-point at 20 mm.:** 79°-84°C**Containers:** Pressed steel lined drums, 85 lb. (about 10 gal.)**ETHYLENE**C<sub>2</sub>H<sub>4</sub>, not less than 99.5%**Containers:** Steel cylinders—Gross weight about 15 lb.

Net weight 2 lb.

**FERTILIZERS, MIXED**

Special formulas

Mixed according to order

Shipped in 100, 125, 167 and 200-lb. bags

**FUSEL OIL NO. 80—REFINED****Weight:** 6.75 lb. per gal.

60% distills above 115°C

**Containers:** Tank cars—8000 gallons

50 or 100-gallon steel drums

**FUSEL OIL NO. 71, REFINED****Weight:** 6.78 lb. per gallon

70% distills above 120°C

Neutral

**Color:** Water white**Containers:** Tank cars—8000 gallons

50 or 100-gallon steel drums

**IODINE, DISTILLED**

Iodine 99.9% to 100%

Free from Chlorine, Bromine, Mineral Residue and Organic Matter

**Containers:** One pound glass stoppered bottles, 12 bottles to the corrugated paper ICC case

Five pound glass stoppered bottle, four bottles to the corrugated paper ICC case

**IODINE, TINCTURE OF (Special)**

Made from distilled Iodine

Quality superior to requirements of U. S. P. IX

**Containers:** 16 fluid ounce glass stoppered amber bottles, 12 bottles to the corrugated paper ICC case**METHYL ACETATE—ANHYDROUS****Weight:** 7.83 lb. per gallon at 60°F**Specific Gravity:** 0.938 to 0.942**Boiling-point:** 56°-58°C**Ester:** 99.5-100%**Containers:** 5 or 10-gallon pressed steel lined drums

1/2 liter bottles, 36 bottles to the case

**METHYL ACETATE, COMMERCIAL****Weight:** 7.5 lb. per gallon**Saponification (as Methyl Acetate):** 80%**Acidity (as Acetic):** Not more than 0.1%**Specific Gravity at 60°F:** not less than 0.900**POTASH MATERIALS**

Derived from distillery waste

F. C. Ash approximately 35% K<sub>2</sub>O

Sulfate of Potash

Murrate of Potash

Carbonate of Potash

Shipped in 200-lb. bags

**POTASSIUM IODIDE**

Conforms to requirements of U. S. P. IX

**Containers:** 4-oz. bottles, 36 bottles to the corrugated paper ICC case

24-oz. bottles, 12 bottles to the corrugated paper ICC case

**ESTERS**

The following are special esters which we are prepared to make on order. About ten days required:

Diethyl Carbonate

Ethyl Benzoate

Ethyl Butyrate

Ethyl Cyanide

Ethyl Formate

Ethyl Fumarate

Ethyl Isovalerate

Ethyl Lactate

Ethyl Malate

Ethyl Maleate

Ethyl Monochloroacetate

Ethyl Oxalate

Ethyl Propionate

Ethyl Salicylate

Isoamyl Acetate

Isoamyl Formate

Isoamyl Isovalerate

Isoamyl Propionate

Isobutyl Acetate

Isobutyl Butyrate

Isobutyl Formate

Isobutyl Isovalerate

Isobutyl Propionate

Isopropyl Oxalate

Methyl Formate

Normal Propyl Acetate

Normal Propyl Isovalerate

Normal Propyl n-Butyrate

Normal Propyl Propionate

# W. H. VAN WINCKEL

50 EAST 42ND STREET, NEW YORK, N. Y.

The Haritan Aniline Works  
New Brunswick, N. J.  
The Nitro Products Corporation  
Nitro, W. Va.

SOLE SELLING AGENT FOR

The Uniform Color & Chemical Co., Inc.  
Perth Amboy, N. J.  
The T. M. & G. Chemical Co.  
Belleville, N. J.

Thatcher Process Co.  
Syracuse, N. Y.

## PRODUCTS

Aniline Oil  
Anthraquinone  
Benzidine Base  
Benzidine Sulfate  
Carbazole  
Diethylaniline  
Ethylbenzylaniline  
H Acid  
Monoethylaniline  
Nitrobenzol  
Thiocarbanilide

### ANILINE OIL $C_6H_5NH_2$

Our aniline is scientifically made, thoroughly rectified, is pure in composition and pale in color.

Physical constants: Specific gravity 1.0235, melting-point  $5.96^{\circ}C$ ; boiling-point  $184.4^{\circ}C$ .

Shipping containers: Iron drums.

Uses: Manufacture of dyestuffs and intermediates, organic synthesis; rubber industry; solvent.

### ANTHRAQUINONE $C_{14}H_8(O)_2$

Produced by the Thatcher process, yielding an exceedingly pure product, eminently suited for dyestuff manufacture.

Physical constants: Specific gravity 1.419-1.438, melting-point  $284.6^{\circ}C$ .

Shipping containers: Wooden barrels.

Uses: Manufacture of intermediates for the production of alizarin, anthraquinone and quinazolin dyestuffs; indigo discharge.

### BENZIDINE BASE $C_6H_4NH_2NH_2$

Produced from our own nitrobenzol and redistilled, we are able to fully guarantee the purity and uniformity of the product.

Grades: Dry (Recrystallized); Paste.

Physical constants (Dry): Melting-point  $127^{\circ}C$ ; boiling-point  $400^{\circ}C$ .

Shipping containers: Wooden kegs or barrels (50, 100 and 200 lb.).

Uses: Manufacture of dyestuffs, particularly Congo red and azo dyes for cotton; organic synthesis.

### BENZIDINE SULFATE $(C_6H_4NH_2)_2H_2SO_4$

A high grade product produced from raw materials of our own manufacture. Recrystallized, and of guaranteed purity. In paste form only.

Shipping containers: Wooden kegs or barrels (50 and 100 lb.).

Uses: Production of benzidine base, manufacture of dyestuffs; organic synthesis.

### CARBAZOLE $(C_6H_4)_2NH$

A high grade product free from anthracene and phenanthrene.

Physical constants: Melting-point  $238^{\circ}C$ .

Shipping containers: Wooden barrels.

Uses: Manufacture of dyestuffs, organic synthesis.

### DIETHYLANILINE $(C_2H_5)_2N C_6H_5$

Fully rectified, and free from unconverted aniline and other impurities. Never darkens on standing.

Physical constants: Specific gravity 0.9351, melting-point  $38^{\circ}$  to  $39^{\circ}C$ ; boiling-point  $213.5^{\circ}C$ .

Shipping containers: Iron drums.

Uses: Organic synthesis, manufacture of dyestuffs.

### ETHYLBENZYLANILINE $C_6H_5N(C_2H_5)CH_2C_6H_5$

A clear, colorless oil, free from unconverted raw materials and impurities.

Physical constants: Specific gravity 1.034, boiling-point  $286^{\circ}C$ .

Shipping containers: Iron drums.

Uses: Manufacture of dyestuffs, organic synthesis.

### H ACID $C_{10}H_4(OH)(NH_2)(SO_3H)_2$

Produced by scientifically established methods under constant and efficient supervision.

Grade: Powder, sold on a basis of 100 per cent, calculated on a molecular weight of 341.

Shipping containers: Wooden barrels.

Uses: Manufacture of azo dyestuffs.

### MONOETHYLANILINE $C_2H_5NH C_6H_5$

We produce ethylaniline as a colorless liquid, so pure that it does not darken materially on standing.

Physical constants: Specific gravity 0.9631, melting-point  $80^{\circ}C$ ; boiling-point  $206^{\circ}C$ .

Shipping containers: Iron drums.

Uses: Manufacture of dyestuffs, organic synthesis.

### NITROBENZOL $C_6H_5NO_2$

A properly nitrated product, free from impurities. Our redistilled grade is absolutely free from all unconverted benzol, and distills completely within a range of 2 degrees.

Physical constants: Specific gravity 1.19867, melting-point  $8.70^{\circ}C$ ; boiling-point  $210.85^{\circ}C$ .

Shipping containers: Iron drums.

Uses: Production of aniline, benzidine, quinoline, azobenzene, etc., in perfumery as a substitute for essential oil of almonds; production of dust preventives.

### THIOCARBANILIDE $CS(NH.C_6H_5)_2$

A pure, colorless, crystalline product.

Grades: Powder, Leaflets.

Physical constants: Specific gravity 1.3205; melting-point  $151^{\circ}$ - $154^{\circ}C$ .

Shipping containers: Wooden barrels.

Uses: Vulcanization accelerator in the rubber industry; organic synthesis.

### ANTHRACENE OIL PRODUCTS

We are in a position to furnish Phenanthrene and other intermediates derived from anthracene oil at short notice.

# VICTOR CHEMICAL WORKS

FISHER BUILDING, CHICAGO, ILL.

Cable Address  
VICT FACID Chicago



Trade Mark

FACTORIES  
Chicago Heights, Ill.  
Nashville, Tenn.

New York, N. Y. 95 Liberty St.

BRANCH OFFICES  
St. Louis, Mo. Police Bldg.

Nashville, Tenn. 4th & 1st National Bank Bldg.

## PRODUCTS

Manufacturers of

**Oxalic Acid, 99.8% pure**

Crystals and Powdered

**Formic Acid**

All Strengths

**Sulphuric Acid, 60° B $\acute{e}$ .**

**Phosphoric Acid**

**Phosphoric Acid Paste**

**Ammonium Phosphate**

**Baking Powder Chemicals**

**Phosphates**

Mono-Calcium

Di-Calcium

Tri-Calcium

Mono-Sodium

Pyro-Sodium

**Epsom Salt**

U. S. P.

Technical

**Niter Cake**

**Paper Filler**

**Miscellaneous**

- Bicarbonate of Soda
- Sodium-Aluminum Sulphate
- Sodium Sulphate
- Nickel Formate
- Sodium Formate

# W. H. VAN WINCKEL

50 EAST 42ND STREET, NEW YORK, N. Y.

The Haritan Aniline Works  
New Brunswick, N. J.  
The Nitro Products Corporation  
Nitro, W. Va.

SOLE SELLING AGENT FOR

The Uniform Color & Chemical Co., Inc.  
Perth Amboy, N. J.  
The T. M. & G. Chemical Co.  
Belleville, N. J.

Thatcher Process Co.  
Syracuse, N. Y.

## PRODUCTS

Aniline Oil  
Anthraquinone  
Benzidine Base  
Benzidine Sulfate  
Carbazole  
Diethylaniline  
Ethylbenzylaniline  
H Acid  
Monoethylaniline  
Nitrobenzol  
Thiocarbanilide

### ANILINE OIL $C_6H_5NH_2$

Our aniline is scientifically made, thoroughly rectified, is pure in composition and pale in color.

Physical constants: Specific gravity 1.0235, melting-point  $5.96^{\circ}C$ ; boiling-point  $184.4^{\circ}C$ .

Shipping containers: Iron drums.

Uses: Manufacture of dyestuffs and intermediates, organic synthesis; rubber industry; solvent.

### ANTHRAQUINONE $C_{14}H_8(O)_2$

Produced by the Thatcher process, yielding an exceedingly pure product, eminently suited for dyestuff manufacture.

Physical constants: Specific gravity 1.419-1.438, melting-point  $284.6^{\circ}C$ .

Shipping containers: Wooden barrels.

Uses: Manufacture of intermediates for the production of alizarin, anthraquinone and quinazolin dyestuffs; indigo discharge.

### BENZIDINE BASE $C_6H_4NH_2NH_2H_4C_6$

Produced from our own nitrobenzol and redistilled, we are able to fully guarantee the purity and uniformity of the product.

Grades: Dry (Recrystallized); Paste.

Physical constants (Dry): Melting-point  $127^{\circ}C$ ; boiling-point  $400^{\circ}C$ .

Shipping containers: Wooden kegs or barrels (50, 100 and 200 lb.).

Uses: Manufacture of dyestuffs, particularly Congo red and azo dyes for cotton; organic synthesis.

### BENZIDINE SULFATE $(C_6H_4NH_2)_2H_2SO_4$

A high grade product produced from raw materials of our own manufacture. Recrystallized, and of guaranteed purity. In paste form only.

Shipping containers: Wooden kegs or barrels (50 and 100 lb.).

Uses: Production of benzidine base, manufacture of dyestuffs; organic synthesis.

### CARBAZOLE $(C_6H_4)_2NH$

A high grade product free from anthracene and phenanthrene.

Physical constants: Melting-point  $238^{\circ}C$ .

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### DIETHYLANILINE $(C_2H_5)_2NC_6H_5$

Fully rectified, and free from unconverted aniline and other impurities. Never darkens on standing.

Physical constants: Specific gravity 0.9351, melting-point  $38^{\circ}$  to  $39^{\circ}C$ ; boiling-point  $213.5^{\circ}C$ .

Shipping containers: Iron drums.

Uses: Organic synthesis, manufacture of dyestuffs.

### ETHYLBENZYLANILINE $C_6H_5N(C_2H_5)CH_2C_6H_5$

A clear, colorless oil, free from unconverted raw materials and impurities.

Physical constants: Specific gravity 1.034, boiling-point  $286^{\circ}C$ .

Shipping containers: Iron drums.

Uses: Manufacture of dyestuffs, organic synthesis.

### H ACID $C_{10}H_4(OH)(NH_2)(SO_3H)_2$

Produced by scientifically established methods under constant and efficient supervision.

Grade: Powder, sold on a basis of 100 per cent, calculated on a molecular weight of 341.

Shipping containers: Wooden barrels.

Uses: Manufacture of azo dyestuffs.

### MONOETHYLANILINE $C_2H_5NH_2C_6H_5$

We produce ethylaniline as a colorless liquid, so pure that it does not darken materially on standing.

Physical constants: Specific gravity 0.9631, melting-point  $80^{\circ}C$ ; boiling-point  $206^{\circ}C$ .

Shipping containers: Iron drums.

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# THE WARNER CHEMICAL COMPANY

Established 1886

Manufacturers

Cable Address  
"CAUSTIC", New York

Codes  
ABC, 5th Edition  
Lieber's

52 VANDERBILT AVE., NEW YORK, N. Y.

PLANTS Carteret, N. J. South Charleston, W. Va.



## PRODUCTS

**Phosphates, Chlorine Products and other Chemicals,**  
all of our own manufacture.

### ACETIC ANHYDRIDE, 90%

Uses: Pharmaceuticals, dyestuffs, cellulose acetate  
In carboys 100 lb. net, 180 lb. gross, measurements:  
33" x 21" x 19", capacity 5.3 cu. ft.

### ACETYL CHLORIDE

Uses: Pharmaceuticals, perfumes  
In carboys 100 lb. net, 180 lb. gross, measurements:  
33" x 21" x 19", capacity 5.3 cu. ft.

### ACID PHOSPHORIC, 50%, SP. GR. 1.400

Uses: Soft drinks, jellies and other food products,  
matches, etc.

Lead and arsenic-free

In carboys 140 lb. net, 220 lb. gross; measurements:  
33" x 21" x 19", capacity 5.3 cu. ft.

### ALUMINUM HYDRATE, LIGHT, POWDER, 96%

Uses: Printing inks, varnishes, oil-cloth manufac-  
ture

In barrels 90 lb. net, 113 lb. gross, measurements:  
24" x 24" x 30", capacity 10 cu. ft.

### ALUMINUM HYDRATE, LIGHT, LUMPS, 96%

Uses: Printing inks, varnishes, etc.  
In barrels 100 lb. net, 123 lb. gross, measurements:  
24" x 24" x 30", capacity 10 cu. ft.

### CARBON DISULFIDE, REDISTILLED

Uses: Rubber solvent, insecticide, etc.

In 5, 10 and 55 gallon drums, measurements: 5 gal.:  
10" x 10" x 17"; capacity 0.98 cu. ft., 10 gal.:  
14" x 14" x 21", capacity 2.4 cu. ft., 55 gal.:  
25 1/4" x 25 1/4" x 36", capacity 13.3 cu. ft.

### CARBON TETRACHLORIDE

Uses: Non-inflammable solvent, cleaner, fire ex-  
tinguisher

In 5, 10, 55 and 110 gallon drums; measurements:  
5 gal.: 10" x 10" x 17"; capacity 0.98 cu. ft.,  
10 gal.: 14" x 14" x 21"; capacity 2.4 cu. ft.;  
55 gal.: 25 1/4" x 25 1/4" x 36"; capacity 13.3 cu.  
ft.; 110 gal.: 32" x 32" x 42 3/4"; capacity 25.3  
cu. ft.

### CARBON TETRACHLORIDE FLUID

•Freezing-point  $-50^{\circ}$  F.

Uses: For fire extinguishers

In 5, 10, 55 and 110 gallon drums; measurements:  
As above

### PHOSPHORUS OXYCHLORIDE

Uses: Pharmaceutical and technical manufacture

In steel-jacketed lead cylinders: 200 lb. net, tare  
185 lb.; measurements: 21" x 21" x 29"; ca-  
pacity: 7.4 cu. ft.; 650 lb. net, tare 300 lb.;  
measurements: 25 1/4" x 25 1/4" x 36"; capacity:  
13.3 cu. ft.

### PHOSPHORUS TRICHLORIDE

Uses: Pharmaceutical and technical manufacture

In steel-jacketed lead cylinders, 200 lb. net, tare 185  
lb., and 650 lb. net, tare 300 lb.; measurements:  
As above

### SODA, CAUSTIC, LIQUID, 33% $\text{Na}_2\text{O}$

In tank cars and drums

### SODA, CAUSTIC, SOLID FUSED, 76%-78% $\text{Na}_2\text{O}$

In drums 700 lb. net, 720 lb. gross, measurements:  
21 1/2" x 21 1/2" x 31 1/2", capacity: 8.4 cu. ft.

### SODIUM HYPOCHLORITE SOLUTION

Uses: Principally as a bleach for panama hats, high  
grade fabrics, etc., also in the manufacture of  
pharmaceutical chemicals

In carboys 100 lb. net, 180 lb. gross, measurements:  
33" x 21" x 19", capacity 5.3 cu. ft.

### SODIUM PHOSPHATE, MONOBASIC; PHAR- MACEUTICAL

Uses: Manufacture of pharmaceutical products,  
especially effervescent salts

In barrels 400 lb. net, 425 lb. gross, measurements:  
24" x 24" x 30", capacity 10 cu. ft.

### SODIUM PHOSPHATE, MONOBASIC, "PYRO"

Uses: As cream of tartar substitute in metal plating  
In barrels 500 lb. net, 525 lb. gross, measurements:  
24" x 24" x 30", capacity 10 cu. ft.

### SODIUM PHOSPHATE, DIBASIC; ANHY- DROUS U. S. P.

Uses: Medicinal, and in the manufacture of dye-  
stuffs

In barrels 300 lb. net, 318 lb. gross, measurements:  
22" x 22" x 29", capacity 8.1 cu. ft.

### SODIUM PHOSPHATE, DIBASIC; GRANULAR U. S. P.

Uses: Medicinal

In barrels 250 lb. net, 270 lb. gross; measurements:  
22" x 22" x 29", capacity 8.1 cu. ft.

### SODIUM PHOSPHATE, TRIBASIC

Uses: Water softener, boiler compounds, laundries  
In barrels 500 lb. net, 530 lb. gross, measurements:  
27" x 27" x 34", capacity 14.3 cu. ft.; 360 lb.

net, 385 lb. gross, measurements: 24" x 24" x  
30", capacity 10 cu. ft.

In kegs, 150 lb. net, 162 lb. gross; measurements:  
17" x 17" x 24", capacity 4.0 cu. ft., 100 lb.  
net, 110 lb. gross, measurements: 15 1/4" x 15 1/4"  
x 20", capacity 2.7 cu. ft.

### "SNOWHITE"

Uses: Water softener, soap substitute for laundries,  
dairies, hotels, hospitals, etc.

In barrels 360 lb. net, 385 lb. gross; measurements:  
24" x 24" x 30", capacity 10 cu. ft.

Also in kegs as above

### SULFUR CHLORIDE, YELLOW AND RED

Uses: Manufacture of rubber substitutes and in vul-  
canizing rubber

In bottles, jugs and drums

## INFORMATION

Prices and all other information desired will be  
cheerfully furnished on request

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# WILSON & CO.

4100 S. Ashland Ave.

CHICAGO, ILL.

Cable Address  
"WILSON" Chicago

## PRODUCTS

**Blood:** Dried, Ground.  
**Bones:** Various Grades and Kinds  
**Bone Meal**  
**Gelatines**  
**Glues**  
**Greases:** White and Yellow  
**Hide Trimmings:** Calf-skin and Cattle  
**Hoofs:** Cattle; Black and White  
**Hoof Meal**  
**Horns:** Cattle  
**Oil:** Lard, Neatsfoot, and Tallow  
**Oleostearin**  
**Sinews:** Green, Salted  
**Tallow**  
**Tankage:** Ground, Protein

## BONE MEAL

A uniform, finely ground powder, free from lumps and foreign matter; of particular interest in the pigot casting and case-hardening operations in metallurgy

## LARD OIL

### Grades:

Prime Winter, Strained. FFA under 2 per cent  
 Extra Winter, Strained. FFA 2 to 4 per cent  
 Extra. FFA under 5 per cent  
 Special Extra No. 1. FFA 7 to 9 per cent.  
 Extra No. 1. FFA 12 to 15 per cent  
 No. 1. FFA 18 to 20 per cent  
 No. 2. FFA 25 to 30 per cent

In addition to its use as a lubricant, this oil, which is permanently liquid, finds extensive use for oiling wool, and in the production of metal-cutting compounds.

## NEATSFOOT OIL

### Grades:

Extra Prime. FFA 1 per cent.  
 Prime. FFA 5 per cent.  
 W. P. Extra Prime. 20 to 25 Cold Test.  
 W. P. Extra Prime. 30 to 35 Cold Test.  
 W. P. Extra Prime. 40 to 45 Cold Test.  
 Extra No. 1. FFA 12 to 15 per cent  
 No. 1. FFA 18 to 20 per cent.

All of our grades of neatsfoot oil are completely soluble in kerosene, alcohol, ether, and other solvents.

Inquiries from all branches of the leather industry will receive prompt and careful attention

Lubrication engineers will do well to give our oleum bubulum careful consideration when working out their problems.

## OLEOSTEARIN

Being produced from clean, pure materials, our stearin is always white, odorless and tasteless, and never varies in composition

Inquiries from soap and candlemakers, etc., solicited

## TALLOW OIL

Wilson tallow oil (Acidless, FFA never over 1.5 per cent) is produced exclusively from beet tallow. It is of particular interest to soap, candle and grease manufacturers

## PURE FOOD GELATINES

For jellies, marshmallows, ice cream and jelled fruits

## GLUES

For sizing, veneering, jointing and general wood-working

## TECHNICAL AND HATTER'S GELATINE

## PHARMACEUTICAL AND SCIENTIFIC PRODUCTS

The following substances are prepared in a high degree of purity from by products of Wilson & Co.'s manufacturing operations by

### THE WILSON LABORATORIES

4221 South Western Boulevard  
 CHICAGO, ILL.

Abattoir Chemicals

Blood, Dried

Cephalin

Cholesterin

Digestive Ferments

Amylopsin

Pancreatin

Pepsin

Remnin

Fibrin

Glandular Desiccations

Lecithin

Ligatures and Surgical Material

Ox-gall

Peptone

Pharmaceutical Elixirs

## OX-GALL

Our inspissated ox-gall is an excellent fat-splitting enzymic product for use in the tanning industry (bating). Inquiries solicited.

---

DR. ALFRED PFISTER, President and Treasurer

S. E. TYLEE, JR., Secretary and Asst. Treasurer

## JACQUES WOLF & CO.

Manufacturing Chemists and Importers

Main Office and Works

PASSAIC, N. J.

New York Office 112 John Street

Cable Address

"WOLF" Passaic

ABC Code, 4th & 5th Editions

---

### PRODUCTS

#### All Sulphonated and Saponified Castor Oils

Soluble Oil, Turkey Red Oil, Alizarine Assistant

#### Monopole Oil

Reg. Trade-Mark No. 709911

The best product for dyeing and finishing

#### Sizing and Finishing Products for Cotton, Wool, and Silk

Gum A. N., Parmentine, Lustrose, Excelsior Size.

#### Colors and Mordants for Fabric Printing

#### Boil-off Oil for Degumming Silk

#### Acetate of Alumina, Waterproofing Materials

##### Artistain

To remove oil and dirt spots.

#### Hydrosulphite for Discharge Printing and Strip- ping

#### Indigolite for Indigo Discharge

#### Alizarine Yellows

For calico printing and wool dyeing.

#### Chrome Black

For wool.

#### Bleaching Oil

A specialty for the kier-boil.

#### Bensapol

The best wool scouring agent.

#### Levuline

An excellent softener for Sulphur and Developed  
Blacks.

#### Textile Gums for Printing

Free from grit; ready for printing.

#### Gums

Arabic, Karaya, Tragacanth—Dry and in solu-  
tion.





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## Technical and Scientific BOOKS SECTION

There is a great convenience as well as a saving in ordering a list of several books from one house rather than from individual publishers.

In the following pages will be found a list, practically complete, of books in English dealing with those subjects in which the users of The Chemical Engineering Catalog are likely to be interested. Any of these books may be ordered of us and **will be furnished at the publisher's own net prices.** We will endeavor to secure any available book now in print on these terms.

Market conditions affecting foreign books have not stabilized, and for this reason we have not included many foreign books in this list. We will make every effort to secure foreign works when wanted and welcome correspondence with reference to them.

Our special book service, as indicated above, includes the selection and purchase of volumes for those desiring to establish libraries, whether individuals or manufacturing concerns. Such libraries may comprise a few books covering some one phase of a subject, or may contain several hundred items. The editorial staff of The Chemical Engineering Catalog includes men trained both in chemical lines and in library work, and the advice and counsel of these men is available for those interested in the installation of libraries in any of the branches included in the broad classification of chemical and allied industries. We shall also be glad to compile bibliographies on any subject in our field. Terms by agreement.

### HOW TO FIND THE BOOK YOU WANT

The main entries of books are all made under the last names of the authors, arranged alphabetically, and supplemented by a Subject Index.

If books on a certain specific subject are desired and the authors' names are not known, look in the Subject Index under the name of that subject. For example, you will find in the Subject Index, under Fats and Oils, books by Andes, Archbutt, Bolton, Brannt, etc. By referring to these names in the main author alphabet, the books desired will be found. Note also, that to supply reference to all the literature on such a subject as Lubricants, for instance, the Subject Index shows not only books devoted entirely to that subject, but also other works treating of linseed oil listed under the heading of Fats and Oils, and under Friction.

### BOOK TITLES AND DESCRIPTIONS

Spelling of authors' names, titles of books, descriptions, tables of contents, etc., are all taken direct from the publishers' own catalogs. Every precaution has been used to insure accurate transcription and the inclusion of all appropriate items,

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# CONDENSED CHEMICAL DICTIONARY

(SECOND PRINTING CORRECTED)

Published by

The CHEMICAL CATALOG COMPANY, Inc.

One Madison Avenue, New York

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The CONDENSED CHEMICAL DICTIONARY, compiled by the editorial staff of The Chemical Catalog Co., Inc., is a handy reference work of five hundred and twenty five pages giving in condensed and readily accessible form essential information regarding chemicals, minerals and materials in general use.

It contains the names of approximately seven thousand chemicals and substances with cross references, together with their chemical formulas, colors and properties; specific gravities; melting-points; boiling-points; solubility in water, alcohol, ether and other solvents, their derivation and preparation, with a brief outline of the process used, their grades, uses and the kinds of containers in which they are customarily shipped; also the fire hazards, if any, and the railroad shipping regulations pertaining to each item.

The asterisk (\*) following the name of the substance indicates which items are at present being produced in America. Paper of good quality is used and there is a wide margin at the bottom of each page for notes and memoranda.

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A copy of The CONDENSED CHEMICAL DICTIONARY will be found indispensable to every chemist; to manufacturers of and dealers in chemicals and chemical equipment, drugs and all commodities which in any way enter into manufacture where chemical processes are used; export and import houses, libraries, transportation companies, fire insurance companies, financial houses, and many others requiring the information contained by this book, for constant use or occasional reference

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## SPECIMEN PAGE (ACTUAL SIZE)

Dichloroethyl

192

Diethylaniline

Dichloroethyl Oxide. See Dichloro-ether

Didymium. See Praseodymium and Neodymium

**Dichlorohydrin, Alpha-\*** (Alpha-propenyl-dichlorohydrin, Glycerin dichlorohydrin, Dichloroisopropyl alcohol)  $\text{CH}_2\text{ClCH}(\text{OH})\text{CH}_2\text{Cl}$   
Color and properties Colorless, ethereal liquid

**Didymium Nitrate.\***

Color and properties Violet-red, hygroscopic crystals. Recent chemical investigations show that didymium nitrate consists of a mixture of praseodymium and neodymium nitrates

Constants Specific gravity 1.396, boiling-point  $174^\circ\text{C}$   
Soluble in alcohol and ether, slightly soluble in water

Derivation From monazite sand extraction, after removal of cerium and thorium

Derivation By the interaction of glycerin and dry hydrochloric acid gas and subsequent distillation

Grades Technical  
Containers Wooden kegs  
Uses Incandescent gas mantles

Method of purification Rectification

Fire hazard Dangerous  
Railroad shipping regulations Yellow label

Grades Technical

Containers Iron drums  
Uses Solvent for hard resins and nitro-cellulose, manufacture of photographic lacquers, cement for celluloid, binder for water colors, organic synthesis

**Diethylacetal.** See Acetal

Fire hazard Dangerous

**Diethylaldehyde.** See Acetal

Railroad shipping regulations. None

**Diethylamine\* ( $\text{C}_2\text{H}_5)_2\text{NH}$**

Color and properties Volatile, colorless, inflammable, strongly alkaline liquid

**Dichloroisopropyl Alcohol.** See Dichlorohydrin, Alpha-

Constants Specific gravity 0.710, boiling-point  $56^\circ\text{C}$

**Dichloromethane.** See Methylene chloride

Soluble in water and alcohol

**Dichloromethyl Ether\* ( $\text{CH}_2\text{Cl})_2\text{O}$**  A military poison gas used in the late war

Derivation By the interaction of dilute potassium hydroxide and dimethylethylaniline or nitrosodiethylaniline

**Dichlorophthalic Acid.** See Acid dichlorophthalic

Method of purification Rectification

Grades Technical

Containers Iron drums

Uses Organic synthesis

Fire hazard Dangerous

Railroad shipping regulations: Red label

**Dicyanodiamide\*  $\text{NH}_2\text{C}(\text{NH}_2)\text{NH}_2$**

Color and properties Grayish-white powder

**Diethylaniline\* ( $\text{C}_2\text{H}_5)_2\text{NC}_6\text{H}_5$**

Color and properties Yellowish to brownish inflammable liquid

Constants Melting-point  $204-205^\circ\text{C}$

Constants Specific gravity 0.9351, melting-point  $-38^\circ$  to  $-39^\circ\text{C}$ , boiling-point  $213.5^\circ\text{C}$

Soluble in water and alcohol, sparingly soluble in ether

Soluble in alcohol and ether; slightly soluble in water

Derivation By heating cyanamide to  $150^\circ\text{C}$

Derivation (a) By heating aniline, aniline hydrochloride and ethyl alcohol (b) By heating ethyl bromide, aniline and caustic soda in an autoclave

Method of purification Crystallization

Grades Technical

Containers Wooden barrels

Uses Fertilizers

Fire hazard None

Railroad shipping regulations: None

Method of purification: Rectification.

\* Indicates made in America

# American Chemical Society MONOGRAPHS

To develop a desirable chemical literature in English, it has been apparent for some time that there must be some consideration other than the primarily commercial given to the problem, and that the best way to obtain this consideration was by concerted action on the part of individuals or collections of individuals through their professional organizations most interested in having such a literature.

The whole subject was discussed and pretty thoroughly threshed out at the Interallied Conference of Pure and Applied Chemistry, which met in London and Brussels in July, 1919. As a result of this discussion the American Chemical Society agreed to investigate and see what could be done. Prominent publishers of technical books in the United States were consulted, and the problem of a suitable chemical literature along the lines required by the Society, submitted to them.

It can now be said that the American Chemical Society Monographs are at last an assured fact. Four of them have already been produced and others are on the way. Authors for still others are being sought by the Society's Board of Editors, and we are now in a position to say that the hopes of the Society and of those sincerely interested in the development of a chemical literature in English are about to be realized. All that is necessary to assure this success is for the chemists and technical men themselves to recognize individually the work that has been done and to encourage its continuance by the kind of support it deserves.

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### The Chemistry of Enzyme Actions

By K. GEORGE FAULK. 140 pages. Published Jan. 15, 1921. Price \$2.50

### Chemical Effects of Alpha Particles and Electrons

By SAMUEL C. LIND. 180 pages. Published May 1, 1921. Price \$3.00

### Organic Compounds of Mercury

By FRANK C. WHITMORE. 395 pages. Published July 15, 1921. Price \$4.50

### Industrial Hydrogen

By HUGH S. TAYLOR. About 220 pages, illustrated. Published September, 1921. Price \$3.50.

## IN PREPARATION

### Piezo-Chemistry

By L. H. ADAMS. Estimated number of pages, 350, illustrated. (Ready about Dec. 15, 1921.)

### The Animal as a Converter

By HENRY PRENTISS ARMSBY. About 250 to 300 pages, illustrated. (Ready about Oct. 20, 1921.)

### Cyanamide

By JOSEPH M. BRAHAM. Number of pages not estimated. Date of delivery undetermined.

### The Corrosion of Alloys

By COLIN G. FINK. (Ready about Oct. 15, 1921.)

### Ammonia Compounds

By E. C. FRANKLIN. Number of pages not estimated. Date of delivery undetermined.

### Wood Distillation

By L. F. HAWLEY. Number of pages not estimated. Date of delivery undetermined.

### Thyroxin

By F. C. KENDALL. (Ready about Feb. 1, 1922.)

### The Properties of Electrically Conducting Systems

By CHARLES A. KRAUS. About 400 pages, illustrated. (Ready about Nov. 15, 1921.)

### Shale Oil

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### Carotinoids and Related Pigments: The Chromolipins

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By B. D. SAKLATWALLA. Number of pages not estimated. Date of delivery undetermined.

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By H. C. SHERMAN. About 500 pages, illustrated. (Ready about Dec. 1, 1921.)

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By ROBERT B. SOSMAN. About 500 pages, illustrated. (Ready about Dec. 1, 1921.)

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### The Chemistry of Leather Manufacture

By JOHN A. WILSON. About 400 to 500 pages. Ready about March, 1922.

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| <b>Wood Preservation</b><br>Wagner, J. B.   |   | Y.<br><b>Yearbooks</b><br>Atack, F. W.      | <b>Zinc</b><br>Ingalls, W. R.<br>Lones, T. E.                                  |   |



# TECHNICAL AND SCIENTIFIC BOOKS SECTION

**ABDERHALDEN, E. Text-Book of Physiological Chemistry** in Thirty Lectures. By Emil Abderhalden, O. Professor für Physiologie des Physiologischen Instituts der Tierärztlichen Hochschule, Berlin, und Universitäts-Professor. Translated by William F. Hall, Associate Professor of Analytical Chemistry, Massachusetts Institute of Technology, and George Detren. 7:2 p. 8 vo. 1908. \$5.00

**CONTENTS:** Introduction, Carbohydrates, Fats, Albumens of foods, The nucleoproteins and their cleavage products, Mutual relations between fats, carbohydrates and albumens, Inorganic foods, Oxygen, Animal oxidations, Ferments, The functions of the digestive organs, The blood, Blood and lymph, The elimination of metabolic products from the body, The relation of the organs to one another, General metabolism, General metabolism, Outlook.

**ABEGG, R. Electrolytic Dissociation Theory.** By Prof. R. Abegg, Ph.D., of the University of Breslau. Authorized translation from the German by Carl E. von Ende, Ph.D., Professor of Chemistry, University of Idaho. 180 p. 12 mo. 1907. \$1.75

**CONTENTS:** Preface, Fundamental conceptions of the theory, Mobility of the ions, Equilibrium among ions, The dissociation constant, Equilibrium among several electrolytes, Hydrolysis, Acidity, Indicators, Heterogeneous equilibria, Anomaly of strong electrolytes, Influence of pressure and temperature on dissociation, Non-aqueous solutions, Chemical nature and ionization tendency of the elements, Index.

**ABRAHAM, HERBERT. Asphalts and Allied Substances.** Their occurrence, mode of production, uses in the arts and methods of testing. Second edition corrected. 635 p. 8 vo. 208 il. 1920. \$6.00

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The explicit instructions for carrying out the processes, together with the able treatment of the theoretical considerations, render this book of particular value to assistants and students, while its comprehensiveness and reliability will appeal very strongly to older and more experienced chemists. *Engineering.*

**ARRHENIUS, S. Theories of Solutions.** By Svante Arrhenius, Ph.D., M.D., Sc.D., Director of the Physico-Chemical Department of the Nobel Institute, Stockholm, Sweden. (Silliman Memorial Lectures.) 247 p. 8 vo. 1912. \$2.75

The lectures included in this volume are not a repetition of facts already found in textbooks on chemistry, but rather a review of recent work and a definition of our present position on various topics concerning theories of solutions, most particularly those topics which are at present in a state of rapid development. To the busy chemist who desires to keep pace with recent advances made by the many workers in this field the book will be of great value. The simple and extremely clear treatment is characteristic of the author. *The Yale Scientific Monthly.*

**ARUP, PAUL S. Industrial organic analysis for the use of technical and analytical chemists and students.** With a foreword by J. C. Irvine. 340 p. 12 mo. il. 1913. \$2.25

**ASCH, W., and ASCH, D. The Silicates in Chemistry and Commerce.** Including the exposition of a hexite and pentite theory and of a stereo chemical theory of general application. Translated, with critical notes and additions, by Alfred B. Searle. 476 p. 8 vo. il. 1914. \$7.50

**CONTENTS:** Chemistry of carbon and silicon, Historical review of existing theories concerning the constitution of the aluminosilicates and other silicates, Critical examination of existing theories concerning aluminosilicates, Hypothesis concerning the bonding of the atoms in aluminosilicates and allied compounds, Consequences of the "hexite-pentite theory" and the facts, Reactions during double decomposition, Genetic relationship between various aluminosilicates, Possibility of a chemical system of aluminosilicates, Variable chemical behavior of part of the aluminum in kaolin, nepheline, and in the epidotes, Minimum molecular weight of aluminosilicates, Constitution of amleite, Possibility of isomerism, Water of crystallization and of constitution, Basic and acid water, Prognoses, Constitution of the complexes of molybdenum and tungsten, Constitution of clays, Ultramarines, New theory of hydraulic binding materials and particularly of portland cement, Of the porcelain cements as used for dental fillings, Of glass, glazes and porcelain, Hexite-pentite theory as a general theory of chemical compounds, Conversion of the H-P theory into a stereo chemical theory and the combination of the latter with the modern theory of the structure of crystals, Summary and conclusions, Bibliography, Appendix, Formulas and analysis.

**ASHCROFT, E. A. A Study of Electrothermal and Electrolytic Industries.** By Edgar A. Ashcroft. Statistics by L. J. Mollkehausen. In three parts. Part I. Introductory. 150 p. 8 vo. il. \$2.00

Gives cost and quantity of production of metals for years of 1850 to 1907, inclusive.

**ASHE, S. W. Organization in Accident Prevention.** 140 p. 8 vo. il. \$2.00

Outlines the educational work necessary amongst employees in organizing accident prevention work in industrial plants, with examples of conditions to be met, and what has been accomplished in the plants of various companies, the methods employed, etc.

Author is chairman, Committee on Safety and Health, National Association of Corporation Schools.

**ASHLEY, R. HARMON. Chemical Calculations.** Second edition. Author is assistant professor in chemistry in the University of Maine. 276 p. 12 mo. il. 1918. \$2.50

**CONTENTS:** Ratios, Approximate numbers, Interpolation, Heat, Specific gravity, Gas calculations, Calculation of atomic weights and formulas, Gravimetric analysis, Volumetric analysis, Use of specific gravity tables and acid calculations.

**ASKINSON, GEORGE WILLIAM. Perfumes and cosmetics,** their preparation and manufacture. 344 p. 8 vo. il. 1915. \$5.00

Containing complete directions for making handkerchief perfumes, smelling salts, sachets, fumigating pastils, preparations for the care of the skin, the mouth, the hair, cosmetics, hair dyes, and other toilet articles. With a detailed description of aromatic substances, their nature, tests of purity, and wholesale manufacture. A chapter on synthetic products with formulas for their use is also included.

**CONTENTS:** Chapter I. History of perfumery. II. About aromatic substances in general. III. Odors from the vegetable kingdom. IV. Aromatic vegetable substances employed in perfumery. V. Animal substances used in perfumery. VI. Chemical products used in perfumery. VII. Extraction of odors. VIII. Special characteristics of aromatic substances. IX. Adulterations of essential oils and their recognition. X. Synthetic products. XI. Table of physical properties of aromatic chemicals. XII. Essences or extracts employed in perfumery. XIII. Directions for making the most important perfumances and extracts. XIV. Division of perfumery. XV. Manufacture of handkerchief perfumes. XVI. Formulas for handkerchief perfumes. XVII. Ammoniacal and acid perfumes. XVIII. Dry perfumes. XIX. Formulas for dry perfumes. XXI. Antiseptic and therapeutic value of perfumes. XXII. Classification of odors. XXIII. Some special perfumery products. XXIV. Hygienic and cosmetic perfumery. XXV. Preparations for the care of the skin. XXVI. Manufacture of casein. XXVII. Formulas for emulsions. XXVIII. Formulas for creams. XXIX. Formulas for meals, pastes, and vegetable milk. XXX. Preparations used for the hair. XXXI. Formulas for hair tonics and restorers. XXXII. Formulas for hair oils. XXXIII. Formulas for the manufacture of pomades and hair oils.

XXXIV. Hair dyes and depilatories. XXXV. Wax pomades, hand lotions and brilliants. XXXVI. Skin cosmetics and face lotions. XXXVII. Preparations for the nails. XXXVIII. Water softeners and bath salts. XXXIX. Preparations for the care of the mouth. XL. Colours used in perfumery. XLI. Utensils used in the toilet.

**ASKLING, C. W., and ROESLER, E.** Internal Combustion Engines and Gas-producers. This work is partly a translation and partly an adaptation of the authors' book on the same subject published in Swedish. The work has been divided between the two authors. E. Roesler has written the first part of the book on Producers, etc. and C. W. Askling has carried out the second part, which deals with Engines, etc. The British system of weights and measures has been used throughout, but data have often been given in the metric system. 304 p. 8 vo. il. 1912. \$4.50

**Contents:** Part I. The method of working of internal combustion engines compared with that of other heat-engines. The production, preparation, composition and qualities of the fuels mostly employed in gas or oil engines. Producers with accessories, general principles of design. General rules for the care of solution gas plants. Producer plants built for gas power purposes.

Part II. Principal power cycles of internal combustion engines. Gas engines. Oil engines. The Humphrey gas pump. Combustion and combustion engines. Index.

**ATACK, F. W., and WHINYATES, L., Editors.** Chemists' Year Book, 1921, including a new section on Coal-tar. Sixth edition. 1125 p. 2 vols. 12 mo. Not sold separately. \$6.50

**Contents:** Volume I. Atomic Weights, 1920. Multiples of the Atomic Weights. Formulae Weights of Certain Radicals and the Multiplex Periodic System of Mendeleff. Qualitative Analysis. Reagents. Gas Analysis. Ultimate Analysis of Organic Substances. Electrochemical Analysis. Spectrum Analysis. General Properties of Inorganic Substances. General Properties of Organic Compounds. Notation of Organic Compounds. Useful Memoranda. Conversion Tables for Weights and Measures. Signs used for Medical Prescriptions. Vice Figure. Logarithms. Mathematical Constants. Mensuration. Formulae. Powers of Numbers. Natural Sines and Tangents. Hydrometric Tables. Conversion of Scales of Temperature. Conversion of Barometric Readings.

**Contents:** Volume II. Notable Dates in the History of Chemistry. Physical Chemical Constants. Physical Constants of the Elements. Physical Constants of Alloys. Specific Heats. Viscosity. Refractive Indices. Cryoscopic Constants. Density and Specific Gravity. Density of Water. Density of Mercury. Specific Gravities of Solutions. Universal Dilution Table. Densities of Gases. Solubilities of Gases in Liquids. Solubilities of Solids in Liquids. Solubilities of Liquids in Liquids. Correction of Gas Volumes. Correction of Barometer Readings. Vapor Pressure. Correction of Thermometer Readings. Correction of Boiling points. Crystallography. Properties of Minerals. Water. Analysis. Fuels and Illuminants. Efficiency of Boiler Plant. Analysis of Clays, Firebricks, and Silica Materials. Analysis of Portland Cement. Acid and Alkali Manufacture. Oils and Fats. Essential Oils. Paints and Pigments. Agricultural Chemistry. Dairy Products. Carbohydrates. Brewing Materials. Beer and Spirits. Lamin Materials. Cellulose and Paper. Textile Fibers. Intermediate Products. Composition of Synthetic Dyestuffs. Coal-tar. Identification of Dyestuffs. Physiological Chemistry. Alkaloids. Pharmaceutical Names of Synthetic Compounds. Trade Names of Drugs. India rubber. Tobacco. Photography. Glossary of certain Medical Terms. Chemical and other Scientific Journals. Index.

**AULD, S. J. M., and EDWARDES-KER, D. R.** Practical Agricultural Chemistry. 243 p. il. 8 vo. 1913. \$2.50

**Contents:** Plant life, Soils, Fertilisers and manures, Feeding stuffs, Dairy products, Examination of waters and soap, Index.

**AUSTIN, LEONARD S.** Metallurgy of the Common Metals. 615 p. 8 vo. il. 1921. \$7.00

**Contents:** Part I. General Metallurgy. Ores and Metals. Combustion and Fuels. Refractories. Sampling, Crushing and Grinding. Screening and Classifying. Metallurgical Furnaces. Combustion, Metallurgical. Thermochemistry. Roasting. Concentration of Ores as a Subsidiary Operation in Metallurgy. Part II. Gold, etc.

**AVRAM, MOIS H.** Patenting and Promoting Inventions. 166 p. 8 vo. 1918. \$1.50

A discussion of the entire subject of commercial patents, how to secure, protect and promote them, from the standpoint of the inventor, promoter and investor.

**BABCOCK & WILCOX CO.** Steam, its Generation and Use. 315 p. 8 vo. 35 Ed. 1919.

**Contents:** The Early History of the Generation and Use of Steam. Brief History of Water Tube Boilers. Requirements of Steam Boilers. Evolution of the Babcock & Wilcox Water Tube Boiler. The Babcock & Wilcox Boiler. Heat and its Measurement. The Theory of Steam Making. Properties of Water, Boiler Feed Water, Feed Water Heating and Methods of Feeding. Steam, Moisture in Steam, Superheated Steam, Properties of Air, Combustion, Analysis of Flue Gases, Classification of Fuels. The Determination of Heating Values of Fuels. Combustion of Coal, Solid Fuels other than Coal and Their Combustion. Liquid Fuels and their Combustion. Gaseous Fuels and their Combustion. Utilization of Waste Heat. Chimneys and Draft. Efficiency and Capacity of Boilers. The Selection of Boilers with a Consideration of the Factors Determining such Selection. Operation and Care of Boilers. Brickwork Boiler Settings. Boiler Room Piping. Flow of Steam through Pipes and Orifices Heat Transfer.

**BACKERT, A. O.** A.B.C. of Iron and Steel. 375 p. 4 to. il. 1919. \$5.00

Treats in an elementary way of the manufacture and properties of iron and steel.

**BACON, JOHN LORD, and MARKHAM, EDWARD R.** Forge-Practice and Heat Treatment of Steel. Third edition, revised and enlarged. 418 p. 8 vo. 400 figures. Cloth. \$2.50

Recently revised to cover heat measuring and hardness testing instruments, various modern appliances, and the installation of up-to-date systems. Intelligent study of its contents will lead to the broader knowledge of heat treating methods which is now required of the man actually doing the work.

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Calculation of Stock for Bent Shapes. Upsetting. Drawing Out and Bending. Simple Forged Work. Calculations of Stock and Making General Forgings. Steam hammer Work. Duplicate Work. Tool Forging and Tempering. Miscellaneous Work. Tables. Course of Exercises in Forge Work.

**BACON, R. F. and HAMOR, W. A.** The American Petroleum Industry. By Raymond Foss Bacon, Ph.D., Director and William Allen Hamor, M.A., Assistant Director of the Mellon Institute of Industrial Research. Volume I, 456 p. Volume II, 519 p. 8 vo. il. 1916. \$12.00

It is the first to cover present-day American practice in distinctly modern in every respect, and is suitable not only as a general reference work for those engaged in the industry, but also as a textbook for students of petroleum engineering. It covers the chemistry, geology, technology, history, and economics of the subject thoroughly. It places at the disposal of engineers, chemists and students a complete summary of present-day knowledge and practice of this great industry.

**Contents:** Vol. I. I. The geochemistry of petroleum. II. The geology of petroleum, by F. G. Clapp. III. The distribution of petroleum in the United States. IV. The physical and chemical properties of petroleum. V. The history of the petroleum industry in the United States. VI. Oil well technology. VII. The valuation of oil properties, by Roswell H. Johnson. VIII. Some commercial factors involved in the appraisal of petroleum properties, by J. P. Cappeau. IX. Possible causes of the decline of oil wells and suggested methods of prolonging yield, by L. C. Huntley. X. Efficiency in the production of petroleum, by Roswell H. Johnson. XI. The condensation of gasoline from natural gas. Vol. II. XII. Refinery technology. XIII. Special refinery technology. XIV. Refinery engineering. XV. Hygienic considerations. XVI. Some problems of the petroleum industry. XVII. The shale oil industry. XVIII. A glossary of bitumenology.

**BAILEY, B. F.** The Induction Motor. By Benjamin F. Bailey, A.M., Ph.D., Professor of Electrical Engineering, University of Michigan. 225 p. 8 vo. il. \$3.00

Devoted to the theory of the induction motor with special reference to the design and operation of the machines. It lays special emphasis on the observance of the physical actions as a guide to a thorough understanding of the induction motor.

**Contents:** I and II—Introduction. III—Starting torque. IV—Starting devices. V—The induction generator. VI—Variable speed induction motors. VII—More extended theory of the induction motor. VIII—Leakage coefficient. IX—General considerations relating to design. X—Winding. XI—Design of 50 H.P., 750 R.P.M., 3 phase, 230 volt, 140 volt, squirrel cage induction motor. XII—Special types of motors. XIII—Single Phase motors. XIV—Single Phase commutator type motors.

**BAILEY, E. H. S.** A Textbook of Sanitary and Applied Chemistry. Fourth edition, revised. 391 p. 1920. \$2.00

**Contents:** Part I. Sanitary and Applied Chemistry. The Atmosphere, Fuels, Heating and Ventilation, Lighting, Water, Purification of Water Supplies, Sewage, Disposal of Household Waste and Rubbage, Textiles, Cleaning, Soap, Bluing and Bleaching, Disinfectants, Antiseptics and Deodorants, Poisons and Their Antidotes. Part II. Chemistry of Food. Food, Cereals, Starch, Dextrin, Legumes, Bread, Breakfast Foods and Other Special Foods, Sugars, Glucose or Grape Sugar Group, Leaves, Stalks, Roots, etc. used as Food, Composition and Food Value of Fruits, Edible Fats and Oils—Food Value of Nuts; Meat, Eggs, Milk, Cheese and Butter, Non-alcoholic Beverages, Alcoholic Beverages, Food Accessories, Preservation of Foods. Coloring of Food Products, Economy in the Selection and Preparation of Food—Dietetics.

**BAILEY, E. H. S.** Source, Chemistry and Use of Food Products. By F. H. S. Bailey, Ph.D., Professor of Chemistry and Director of Chemical Laboratories, University of Kansas, Lawrence. 517 p. 12 mo. il. 1914. \$1.60

The book discusses the source, preparation for the market, packing, preserving, shipping, composition, nutrient and dietetic value of foods and drinks and their uses by people of different countries.

**BALY, E. C. C.** Spectroscopy. By E. C. C. Baly, F.R.S., Lecturer on Spectroscopy and Assistant Professor of Chemistry, University College, London. Second edition, revised and enlarged. 701 p. 12 mo. il. 1912. \$4.75

**Contents:** Historical, The Slit, Prisms, and Lenses, The Complete Prism Spectroscope, The Prism Spectroscope in Practice, The Diffraction Grating, The ruled Grating in Practice, The Extreme Infra-Red and Ultra-Violet Regions of the Spectrum, The Application of Interference Methods to Spectroscopy, The Practical Resolving Power of the Spectroscope, The Photography of the Spectrum, Methods of Illumination, Phosphorescence and Fluorescence, Absorption Spectra, The Nature of Spectra, The Zeeman Effect, Series of Lines in Spectra, Change of Wave Length, Appendix, Recipes for Solutions for Silvering Glass Mirrors, Index.

**BANCROFT, WILDER D.** Applied Colloid Chemistry. General Theory. 345 p. 8 vo. il. 1921. \$3.00

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**BARKER, ALFRED F.** Textiles. With additional chapters by W. M. Gardner, R. Snow, W. H. Cook and F. Radbury. 387 p. 8 vo. il. \$4.00

**Contents:** History of the textile industries. Textile inventions and inventors. Wools, silk, cotton, flax, etc., growing industries. The mercerized and artificial fibres employed in the textile industries. Dyeing of textile materials. Principles of spinning. Processes preparatory to spinning. Principles of weaving. Principles of designing and coloring. Principles of finishing. Textile calculations. The woolen, worsted, dress goods, stuff and linings, and tapestry and carpet industries. Silk throwing and spinning. The cotton industry. The linen industry historically and commercially considered. Recent developments and the future of the textile industries.

**BARKER, ALFRED F., and MIDGELEY, EBER.** Analysis of Woven Fabrics. 319 p. 8 vo. il. 1914. \$3.50

CONTENTS: Qualities of raw materials and of yarns. Calculations relating to yarns and to the weight of cloths. Setting and setting of clothes. Weave analysis. Drafts and pegging plans. Effects of drying and finishing on wool cloths, on union dress fabrics, lining and cotton cloths. Obtaining the loom particulars from a small sample of finished cloth. Examples in the analysis of woven fabrics. Quick methods of analysis. Standard weights and gauges. Qualitative and quantitative analysis of fibres in woven fabric. Costing of woven fabrics. Glossary of terms applied to woven fabrics. Appendix.

**BARNETT, E. de BARRY.** Anthracene and Anthraquinone. 436 p. 8 vo. 1921. \$6.00

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**BARNETT, E. de BARRY.** Coal Tar Dyes and Intermediates. 229 p. 8 vo. 1921. \$3.50

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**BARNETT, E. de BARRY.** The Preparation of Organic Compounds. Second edition. 273 p. 8 vo. 1920. \$1.25

CONTENTS: Apparatus. Methods of Manipulation. Reagents. Hydrocarbons. Halogen Compounds. Alcohols. Phenols. and Mercaptans. Aldehydes. Ketones. Quinones (and Quinonimides) and Some Other Derivatives of the Same. Ethers and Sulphides. Carboxylic Acids. Their Anhydrides and Esters. Nitriles or Cyanides. Nitroso and Nitro Compounds. Amino Compounds. Diazo, Diazonium, Diazomino, Azo, Azoxy, and Hydrazo Compounds. Sulphinic and Sulphonic Acids. Miscellaneous Types.

**BARR, WILLIAM MILLER.** Industrial Engineering. 619 p. 8 vo. il. 1918. \$4.00

Study of chemical and physical properties of materials used in engineering, including those investigated, approved and adopted for government work. Index.

**BARR, WILLIAM M.** Pumping Machinery. A practical Hand-Book Relating to the Construction and Management of Steam and Power Pumping Machines. Second Revision. 481 p. 8 vo. il. \$6.00

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**BASKERVILLE, C., and CURTMAN, L. J.** A Course in Qualitative Chemical Analysis. New and revised edition. 223 p. 8 vo. 1916. \$2.20

CONTENTS: Preface. Introduction. Metals. Acids. Preliminary Examination. Complete Analysis. Appendix. Index.

**BASKERVILLE, C.** Municipal Chemistry. Contributed by leading authorities. Edited by Charles Baskerville, Ph.D., F.C.S., Professor of Chemistry, College of the City of New York. 526 p. 8 vo. il. \$5.00

CONTENTS: Sanitation. Drinking Water and Disease. Municipal Water Supply. Purification of Water. Milk. Food Adulteration. Food Inspection. Drugs and Their Adulteration. Habit Forming Agents. Street and Road Construction. Street Sanitation. Street Cleaning. Waste Disposal. Disposal of City Sewage. Illuminating Gas. The Smoke Problem. Ventilation. Personal Hygiene. Textile Materials. Combustibles and Explosives. Paint. Corrosion of Iron and Steel. Cement and Concrete. Parks, Gardens and Playgrounds.

**BATTLE, JOHN ROME.** Handbook of Industrial Oil Engineering. A reference book of data, tables, and general information for the use of lubricating engineers, oil salesmen, operating engineers, mill and power plant superintendents and machinery designers, etc. 333 p. 8 vo. il. 1916. \$10.00

Discusses the theory of lubrication, describes the various oils and greases, and tells how they are tested. Chapters are devoted to rolling and sliding friction, the lubrication of steam cylinders, the use of oil and grease cups and filters, the management of oil houses, and information concerning the relation of the steam indicator to lubrication. Part 4 takes up in detail the applications to several special types of machinery, as air compressors, automobiles, coal mining machinery, Diesel engines, baking machinery, electric cars, passenger and freight elevators, flour milling machinery, refrigerating and ice making apparatus, internal combustion engines, marine engines, motors and dynamos, printing machinery, pneumatic tools, locomotives and cars, rolling mills, textile machinery, transformers, turbines, and wire drawing machinery. Part 5 considers costs and specifications. Printed in large clear type, and provided with many illustrations, tables, and charts.

**BAUER, O., and DEISS, E.** The Sampling and Chemical Analysis of Iron and Steel. By O. Bauer and E. Deiss, of the Royal Testing Bureau at Gross-Lichterfelde, Germany. Translated from the German by William T. Hall and Robert S. Williams, Assistant Professors of Analytical Chemistry, Massachusetts Institute of Technology. 373 p. 12 mo. il. 1915. \$3.00

CONTENTS: Part I—Sampling of iron and steel. I—The importance of proper sampling for chemical analysis. II—Arrangement of a

metallurgical laboratory to be used as an aid in taking samples for analysis. III—Treatment of the polished specimens. IV—Metallographic characteristics of the constituents occurring in iron and steel. V—The causes of local differences in the chemical composition of iron and steel. VI—Taking samples in the works. VII—White iron. VIII—Cast iron. IX—Ingot iron and mild steel. X—Wrought iron. XI—Sampling in special cases. Part II—Analysis of iron and steel. I—Carbon. II—Silicon. III—Manganese. IV—Phosphorus. V—Sulphur. VI—Aluminum. VII—Titanium. VIII—Iron. IX—Cobalt. X—Chromium. XI—Vanadium. XII—Molybdenum. XIII—Oxygen. XIV—Nitrogen. Atomic weights.

**BAYLEY, WILLIAM SHIRLEY.** Descriptive Mineralogy. 541 p. 8 vo. il. 1917. \$3.75

This textbook of over 500 pages is not a complete guide to the mineral kingdom, nor does it offer the means of determining the nature of any mineral that may be met with. The descriptions include those of scientific interest and of economic importance, as well as those that illustrate some principle employed in classification. Part I describes blow-pipe analysis and outlines the reactions of the more important elements and acid radicals. The appendices contain a simple guide to the descriptions of minerals, a list of the more important minerals arranged according to their principal constituents, also a list arranged according to crystallization. Author is Professor of Geology at the University of Illinois.

**BAYLISS, W. M.** Enzyme Action (Monographs on Biochemistry). Third edition, revised and enlarged. 180 p. 8 vo. il. 1914. \$2.60

The author is a professor in the University of London. "Perhaps no class of substances has proved more baffling and elusive to chemists than the enzymes, and the author is to be congratulated on the skilful manner in which he has assembled such a large number of facts and observations, and classified them according to the principles and laws developed by the most recent research in the domain of colloid and physical chemistry." Library Committee, The Chemical Club, New York.

**BEADLE, C.** Chapters on Paper-making. In five volumes. 8 vo. each \$2.50

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Vol. V—Concerning the Theory and Practice of Beating. III. 190 p.

**BEAN, PERCY, and McCLEARY, W.** The Chemistry and Practice of Finishing. A practical treatise on bleaching and the finishing of white, dyed, and printed cotton goods. Second edition. Two volumes. 824 p. 8 vo. 1912. net \$15.00

CONTENTS: Chemicals employed in bleaching. Physical and chemical properties of cotton and linen and the chemical examination of the various textile fibres. Practical bleaching of cotton and linen piece goods. Bleaching of cotton goods woven with coloured borders and headings. Stains and faults in cloth due to imperfect bleaching and faulty manufacture. Water and the purification of water used for bleaching purposes. Machinery used in bleaching. Practical finishing. Adhesive and "thickening" substances used in the finishing. Starch, gums, etc. Materials used for giving weight to the fabric. Ingredients used to soften the fabric. Deliquescent substances used for softening and weighting the fabrics. Ingredients used for preserving the fabric from mildew. Colours used for tinting the cloth and the filling. Substances used for rendering fabrics fireproof and waterproof. Practical finishing of cotton piece goods. Machinery used in piece goods, making up and packing machinery. Soft and finished patterns of cloth; analysis of finished cloth.

**BEARDSLEY, R. C.** Design and Construction of Hydroelectric Plants. With special reference to the design of dams. By R. C. Beardsley. A hydraulic and hydroelectric engineer's reference work. 520 p. 8 vo. il. \$6.00

CONTENTS: I—Hydraulic principles. Hydrostatics, hydrodynamics. II—Measurement of flow. Weirs, dams, penstocks and pipes, canals, rivers. III—Reconnaissance of water power. Power measurement, government reports, value of reservoirs, soundings, flowage, height, cost of surveys, engineer's report. IV—Materials. Woods, metals, cement and concrete, concrete steel, strength of materials. V—Hydraulic construction. Piling, drilling, explosives, cable ways, bridges, roller dams, caissons, pumps, embankments, canals, tunnels, penstocks, mats, dams, abutments, flash boards, head gates. VI—Power house construction. Foundations, structure, architecture. VII—Power house equipment. Water wheels, hydro-compressors, auxiliary plants, electric generators, switch boards, instruments and measurements, lightning arresters, transformers, storage battery, motor generator, frequency changes, alignment of machinery. VIII—Power transmission. Gears, coupling, shafting, belting, rope, power lost by friction. Electric transmission, line wire, efficiencies.

**BEATTY, J.** The Method of Enzyme Action. By James Beatty, M.A., M.D., D.P.H., Northampton, England. With an introduction by E. H. Starling, F.R.S. 143 p. 8 vo. 1917.

CONTENTS: Preface. Introduction. Catalysis. Summary. General Considerations on Enzymes, Colloids, Adsorption. The Properties of Enzymes, Chemical Action, Oxidation and the Oxidases, Reduction and the Reducases. The Method of Enzyme Action, A Hypothesis, Deductions, Conclusion, Index.

CONTENTS: Cotton fiber; scouring and bleaching. Dyeing machinery.

**BEAUMONT, ROBERTS.** The Finishing of Textile Fabrics. (Woolen, Worsted, Union and other Cloths). 279 p. 12 mo. il. \$5.00

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**CONTENTS:** Derivation of molecular weight from vapor density. The gas displacement method. Other methods based upon the Gay Lussac principle. Determination of the densities of gases. Critical examination of results. Osmotic methods. Determination of the molecular weight by the freezing-point method. Determination of the molecular weight of solids. Critical examination of results. Determination of molecular weight by the boiling-point method. Critical examination of results. Determination of molecular weight from the principle of lowering of solubility. Determination of the molecular weight of homogeneous solids or liquids. Description of the method of Traube. Modification of the Traube procedure for solutions. Determination of the density of a liquid. Tables.

**BINNS, CHARLES F.** Manual of Practical Potting. Fourth edition, revised and enlarged. 254 p. 12 mo. il. \$8.00

Published by the proprietors of the Pottery Gazette in London. No pains have been spared to make the work represent the best English practice. It contains many formulas printed for the first time.

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**CONTENTS:** Introduction. The translation of the analysis. The atmosphere. Specific gravity and liter weights. Combustion. Products. The immaterial products of combustion. Tension of aqueous vapor according to Regnault.

**BJORLING, PHILIP R., and GISSING, FREDERICK, T.** Peat, Its Uses and Manufacture. 174 p. 12 mo. \$2.50

**CONTENTS:** Formation, growth, and distribution. Specific gravity and analysis, methods of obting, cutting, and drying. Drying. Peat fuel manufacture. Nature and uses of peat as a fuel. Uses of peat other than as a fuel. Appendix. Bibliography. List of Patents. Index.

**BLAINE, ROBERT G.** The Calculus and Its Applications. A practical treatise for beginners, especially engineering students. 330 p. 12 mo. il. \$1.75

**BLAIR, ANDREW ALEXANDER.** The Chemical Analysis of Iron. Eighth edition, largely rewritten. 348 p. 8 vo. il. 1918. \$5.00

**CONTENTS:** Apparatus. Reagents. Methods for the analysis of pig iron, bar iron, and steel. Determination of sulphur, silicon, slag and oxides, phosphorus, manganese, carbon, graphite, carbon, combined carbon, titanium, copper, nickel, and cobalt. Chromium, vanadium, arsenic, tungsten, vanadium, molybdenum, nitrogen, iron. Methods for the analysis of chrome, tungsten, steels. Determination of carbon, sulphur, silicon and tungsten. Phosphorus, Manganese, Chromium, Nickel, chromium, and manganese. Vanadium. Methods for the analysis of ferrochrome, ferro-silicon, and ferro-titanium. Determination of carbon, sulphur, silicon, phosphorus, manganese, chromium, iron. Methods for the analysis of iron ores. Determination of silica, alumina, lime, magnesia, manganese oxide, and ferro-silicon-nickel, cobalt, zinc, and manganese. Methods for the analysis of limestone. Methods for the analysis of clay. Methods for the analysis of slates. Methods for the analysis of fire sands. Methods for the analysis of coal and coke. Determination of phosphoric acid. Methods for the analysis of gases. Determination of carbonic acid. Tables. Appendix.

**BLANCHARD, A. H.** Highway Engineers' Handbook. By Arthur H. Blanchard, Editor in Chief, and seventeen associate editors. 1658 p. 12 mo. il. 1919. \$7.00

**CONTENTS:** Terminology of highway engineering. Mathematics, mechanics and structural materials. Engineering geology. Preliminary investigations. Surveys and office practice. Planning of roads and road systems. Planning of streets and street systems. Grading, drainage and foundations. Earth and mud-clay roads. Gravel roads. Broken stone roads. Bituminous materials. Dust prevention by the use of palliatives. Bituminous surfaces. Bituminous macadam pavements. Bituminous concrete pavements. Sheet asphalt and rock asphalt pavements. Wood concrete pavements. Stone block pavements. Brick pavements. Cement concrete pavements. Street cleaning, collection and disposal of waste. Snow removal. Car tracks and pipe systems. Comparison of roads and pavements. Sidewalks, curbs, gutters, and highway signs. Highway bridges, culverts, retaining walls, foundations and guard rails. Preservation of materials used in highway structures. Financing of highway improvements. Organization and administration of highway departments.

**BLASDALE, WALTER C.** Principles of Quantitative Analysis. Second edition, revised and enlarged. 402 p. 8 vo. il. 1917. \$3.00

Well suited for the use of older students of chemistry who require a fairly advanced treatise. It will be found even more useful out of than in the laboratory, for the theories involved in analytical work are thoroughly explained.

**CONTENTS:** Introductory statements and definitions. General features of gravimetric processes. Gravimetric solution and extraction. Gravimetric precipitation processes. Gravimetric solution and extraction processes. Partition processes. General features of volumetric processes. Volumetric processes involving precipitation. Volumetric processes involving neutralization. Volumetric processes involving oxidation. Physico-chemical processes.

**BLOUNT, BERTRAM.** Cement. 284 p. 8 vo. 1920. \$6.00

**CONTENTS:** Historical. Raw materials. Fuel. Manufacture. Power. Works control. Testing. Methods of analysis. Chemistry of Portland cement. The function of the various constituents of cement. Uses of cement. Effect of various substances on cement. By-products of cement.

**BLOUNT, B., and BLOXAM, A. G.** Chemistry for Engineers and Manufacturers. A practical text book. In two volumes.

Vol. I. Chemistry of Engineering, Building and Metallurgy. Second edition. 404 p. 8 vo. il. \$5.00

**CONTENTS:** Chemistry of the chief materials of construction. Of the sources of energy; Of steam raising, Of lubricants and lubrication. Metallurgy. Metalliferous ores and processes. Platinum groups of metals. Metals difficult of reduction.

Vol. II. Chemistry of Manufacturing Processes. Second edition. Cloth, 528 p. 8 vo. il. 1913. \$5.00

**CONTENTS:** Sulphuric acid manufacture; Alkali and its by-products; Destructive distillation; Artificial manure manufacture; Petroleum; Lime

and cement. Clay industries and glass. Sugar and starch. Brewing and distilling. Oils, resins, and varnishes. Soap and candles; Textiles and bleaching. Coloring matters, Dyeing and printing. Paper and paste board. Pigments and paints. Manufacture of leather glue, and size. Explosives. Minor chemical manufactures.

**BLOXAM, A. G., and LEWIS, S. J.** Chemistry, Inorganic and Organic With Experiments. Tenth edition rewritten and revised by Arthur G. Bloxam, F.R.C., and S. Judd Lewis, D.Sc., F.R.C. Tenth edition. 888 p. 8 vo. il. 1911. \$7.00

This work is intended for those studying chemistry as a branch of general education as well as for those professionally interested in the subject. The work has gradually acquired an encyclopedic character and the editors have greatly increased its value by including precise details from original sources. Thorough explanations of common phenomena and experiments illustrating them have been retained for the general reader.

**BLYTH, A. W., and BLYTH, M. W.** Poisons. Their Effects and Detection. Tenth edition, revised, enlarged and rewritten. 799 p. 8 vo. il. 1910. \$12.00

**CONTENTS:** Introductory. Classification. Poisonous gases. Carbon monoxide. Chlorine. Hydric sulphide. Acids and alkalis. Volatile poisonous substances separable by distillation from neutral acids and liquids. Alkaloids and poisonous vegetable principles separated by alcoholic solvents. Poisons derived from living or dead animal substances. Oxids and groups of poisons. Inorganic poisons. Appendix.

**BOCKMANN, F.** Cellulose, Its Raw Material, Manufacture, Properties and Uses. A handbook for manufacturers of cellulose and cellulose articles, and all industries using cellulose, also for dentists and tooth specialists. Translated from the Third Revised German Edition. 110 p. 8 vo. il. \$2.50

**CONTENTS:** Raw Materials for the Manufacture of Cellulose. The Manufacture of Cellulose. Employment of Pyroxylin for Artificial Silk. Properties of Cellulose. Testing, Application and Treatment.

**BOILAS, BERNARD C.** Handbook of Laboratory Glass Blowing. 166 p. il. 8 vo. 1911. \$1.50

**CONTENTS:** Introduction. Easy examples of laboratory glass blowing. Internal seals. Air traps. Spray nozzles. Filter pumps. Glass, its composition and characteristics. Making glass. Temperatures glass blowing apparatus. Index.

**BOLTON, E. R., and REVIS, C.** Fatty Foods, Their Practical Examination. 171 p. 8 vo. il. 1913. \$3.50

This book is intended for those who are continually faced with the problem of investigating or recognizing some of the numerous fatty products which have made their appearance during recent years. Besides the analytical data the book is of value as a source of reference in the characteristics, uses and derivations of modern edible oils and fats. The subject is treated in a systematic and dignified manner, the methods of analysis having been restricted to those which give reliable results and moreover these are described not in a way which leaves much to the imagination, but with a full realization of the point at issue and with full details of both method and manipulation. Numerous carefully prepared and original drawings add greatly to the value of the book.

**BONE, WILLIAM A.** Coal and Its Scientific Uses. 491 p. 8 vo. il. 1919. \$7.50

**CONTENTS:** Introductory. The origin and formation of coal. The chemical composition of coal. The composition of boilers. Domestic heating. The smoke nuisance and its abatement. General considerations relating to the use of gaseous fuels derived from coal. The carbonization in industries. The complete gasification of coal. Water gas and its applications. Fuel economy in the manufacture of iron and steel. Economy of fuel attainable in the blast furnace by the use of dry blast. Power production from coal. Surface combustion.

**BOORMAN, T. H.** Asphalts; Their Sources and Utilization. 141 p. 8 vo. 1914. \$3.00

**BOTTLER, MAX.** German Varnish-Making. Authorized translation with notes on American varnish and paint manufacture by Alvah Horton Sabon. 463 p. 8 vo. il. 1912. \$3.75

**CONTENTS:** Introductory and Historical. Classification of lacquer and varnish. Raw material for making lacquer and varnish. Making lacquer and varnish. Oil varnish and oleoresinous varnish. Turpentine and benzene varnishes. Alcoholic and other volatile and non-volatile varnishes. The coloring, bleaching, and filtering of lacquers and varnishes. Manufacture of printers' ink. Lithographic varnish, soap, resin, and casein lacquers. Notes on varnish making. Paint. Its constitution and nature. Appendix. Notes on analytical methods. Crockett's varnish formulas.

**BOTTLER, M.** Modern Bleaching Agents and Detergents. Translated by C. Salter. 160 p. 8 vo. il. \$2.50

**CONTENTS:** Old and new methods and agents. Sodium peroxide. Peroborates. Ozon. Sodium bisulphate and hydrosulphurous acid. Discharging color from textile fabrics with hydrosulphurous acid. Permanganate. Hydrogen peroxide. New process for bleaching fats, oils, wax, paraffin, soap and glue. Solid stable sodium hypochlorite and bleaching soda. Electric bleaching. Benzene soaps. Extractive detergents and detergent mixtures. Properties of carbon tetrachloride. Acetoacetic acid as a detergent. Special methods of removing stains. Bleaching processes used in chemical cleaning. Hydrogen peroxide. Oxymol and sodium peroxides as detergents. Sundry new detergents and cleansing agents.

**BOOTH, W. H.** Liquid Fuel and Its Apparatus. 8 vo. il. 1912. \$8.00

Presents in more handy form the more immediate practical points in the authors former work "Liquid Fuel and its Combustion," and brings this material up to date.

**BOUGHEY, DAVIDSON.** The Film Industry. (Fittman's Common Commodities and Industries). 105 p. 12 mo. il. 1921. \$1.00

**CONTENTS:** Youth and growth of the film industry. The cinematograph film. The cinematograph camera. Perforating, developing and



drying, printing, tinting, toning and tiling. A motion picture studio; films and film makers. Fiction film production. Travel topics and scientific films. Film distribution and publicity. The projector and the screen. Film exhibition.

**BOURCART, E.** Insecticides, Fungicides, and Weed Killers. Translated by D. Grant. 431 p. 8 vo il. 1916. \$6.00

**Contents:** Plant pathology. Entology. Animal parasites. Vegetable parasites. Mordant parasites. Balanced fertilization. Therapeutics. Vegetable surgery. Prophylaxis. Insecticides, fungicides and weed killers. Dictionary of insects injurious to plants. Dictionary of fungoid diseases of plants.

**BOUKRY, EMILE.** A Treatise on Ceramic Industries. A complete manual for pottery, tile, and brick manufacturers. A revised translation from the French by Alfred B. Scarle. 488 p. 8 vo il. \$6.00

**Contents:** Brief history of ceramics. Raw materials of bodies. Plastic bodies. Properties and composition. Preparation, purification. Processes of formation: throwing, expression, moulding, pressing, casting, shaping, drying, evaporation, vitrification, heat absorption, glazes. Manufacture and application. Firing. Properties of bodies and glazes during firing. Kilns. Decoration. Materials and methods. Terra cotta, bricks, hollow blocks, roofing tiles, paving bricks, pipes, architectural and decorative terra cotta, common pottery, tobacco pipes, Lustre ware, teats, fireclay goods. Varieties, methods of manufacture. Tests. Finishes. Classification, composition, methods of manufacture and decoration. Stoneware. Paving tiles, sanitary ware, for domestic purposes, for chemical products, decorative objects; Porcelain. Classification, composition, manufacture, decoration.

**BOWSER, E. A.** An Elementary Treatise on the Differential and Integral Calculus. With numerous examples. Twenty-third edition. Enlarged by 640 additional examples. 465 p. 12 mo il. \$2.25

**BRADLEY, WALTER W.** Quicksilver Resources of California. 189 p. 8 vo. 1918. \$2.00

General information regarding uses, production, prices, distribution and theories of ore distribution is followed by reports of the mines of the several counties. Part 2, of over 140 pages, is devoted to a general and excellent up-to-date treatise on metallurgy, assaying and concentration. Part 3 has a full bibliography. Contains many maps and illustrations.

**BRAHAM, JOSEPH M.** Cyanamide. American Chemical Society Monograph. In preparation.

**BRAME, J. S. S.** Fuel: Solid, Liquid, and Gaseous. By J. S. S. Brame, F.C.S., Instructor in Chemistry, Royal Naval College, Greenwich, Lecturer on Fuel, Sir John Cass Technical Institute, Aldgate. 388 p. 8 vo il. 1919. \$5.40

**Contents:** Part I. Solid fuels; Introduction; Wood, peat, and minor solid fuels. Coal and its constituents. Commercial varieties of coal. Treatment and storage of coal. Properties and powdered coal. Coking and coking. Special forms of coke. Part II. Liquid fuel. Composition and character of fuel oils. System of burning oil fuel. Liquid fuel for internal combustion engines. Heavy fuel oils for internal combustion engines. Part III. Gaseous fuel: Coal gas and coke oven gas. Water gas, gaseous fuels of low calorific value. Simple producer gas (Stenson's gas) and "mixed" producer gas (Dowson gas). Producer gas plants and blast furnace gas. Fuel consumption and general considerations in power production. Part IV. Fuel analysis: calorimetry and control of fuel supply. Fuel analysis. Determination of calorific values. Purchase of fuel and control of combustion. Appendix. Index.

**BRANNT, WM. T., and GRAY, J. B.** Practical Dry Cleaner, Scourer, and Garment Dyer. Fifth edition, revised, enlarged and entirely reset. 396 p. il. 8 vo. 1920. \$3.00

**Contents:** Dry, chemical or French cleaning. Purification of benzene. Removal of stains or spotting. Wet cleaning, including the cleaning of Palm Beach suits and other summer fabrics. Finishing cleaned fabrics. Cleaning and dyeing furs, skin rugs and mats. Cleaning and dyeing fashions. Cleaning and renovating felt, straw and Panama hats. Bleaching and dyeing straw and straw hats. Cleaning and dyeing gloves. Garment dyeing. Stripping colors from garments and fabrics. Analysis of textile fabrics. Practical chemistry for the cleaner and dyer.

**BRANNT, WILLIAM T.** Metallic Alloys. 519 p. 8 vo il. 1908. \$6.00

A practical guide for the manufacture of all kinds of alloys, amalgams and solders, used by metalworkers, together with their chemical and physical properties and their application in the arts and the industries, with an appendix on the coloring of alloys and the recovery of waste metals.

**Contents:** Introduction. Physical and chemical relations of the metals. Special properties of the metals. General properties of alloys. Preparation of alloys in general. Copper alloys. Copper-tin alloys. Alloys of copper, with other metals. Aluminum alloys. Tin alloys. Lead alloys. Cadmium alloys. Bismuth alloys. Silver alloys. Gold alloys. Alloys of platinum and platinum metals. Alloys of mercury and other metals, or amalgams. Miscellaneous alloys. Solders and soldering. Determination of the constituents of metallic alloys, and the impurities of the technically most important metals, etc. Appendix.—Coloring of alloys. Recovery of waste metals. Index.

**BRANNT, WILLIAM T.** Metal Worker's Handy-Book of Receipts and Processes. 582 p. 8 vo. 82 il. 1919. \$3.00

Being a collection of chemical formulas and practical manipulations for the working of all the metals and alloys, including the decoration and beautifying of articles manufactured therefrom, as well as their preservation. Edited from various sources. New enlarged edition containing new chapters on flame welding and cutting, thermite welding; electric welding; galvanizing; Schoop's spray process; Sherardizing and die castings.

**BRANNT, WILLIAM T.** Practical Treatise on the Manufacture of Vinegar. With special consideration of wood vinegar and other by-products obtained in the destructive distillation of wood; the preparation of acetates; manufacture of cider and fruit-wines; preservation of fruits and vegetables by canning and evaporation; preparation of fruit-butters, jellies, marmalades, pickles, mustards, etc.; preservation of meat, fish

and eggs. Third edition, thoroughly revised and largely rewritten. Cloth. 543 p. 8 vo il. 1914. \$6.00

**Contents:** Part I—Vinegar. Introduction and historical. Theory of the formation of vinegar. The vinegar ferment and its conditions of life. Products of acetic fermentation. Methods of manufacture of vinegar. Quick process of manufacture. Arrangement of a vinegar factory. Artificial ventilation of the vinegar generators. Automatic vinegar apparatus. Operations in a vinegar factory. Preparation of the alcoholic liquid. Execution of the work in a vinegar factory. Disturbing influences in the manufacture of vinegar. Slow process of making vinegar. Further treatment of the raw materials. Vinegar specialties. Manufacture of wine vinegar. Chemical examination of the raw materials, and control of the operations in a vinegar factory. Examination of vinegar as to the presence of foreign acids and of metals, as well as to its derivation. Wood vinegar and other by-products obtained in the destructive distillation of wood. Preparation of charcoal, wood vinegar and tar in closed vessels. Execution of the destructive distillation of wood. Treatment of the wood vinegar. Acetates and their preparation. Preparation of pure wood spirit or methyl alcohol, and of acetone and working the wood tar. Part II. Manufacture of Ciders, Fruit Wines, etc. Introduction. Fruits and their composition. Manufacture of cider. Preparation of fruit wines. Part III. Canning and Evaporating of Fruit, etc. Preservation of fruit; Evaporation of fruit. Preparation of pickles and mustard. Preservation of meat, fish, and eggs. Appendix. Index.

**BRANNT, WM. T., and MEERBOTT, P. B.** Soap Maker's Hand Book. Third edition. Completely revised. 8 vo. 624 p. il. 1921. \$5.50

The latest and most complete book published in the English language on the art of soap-making, and covers the materials, processes and receipts for every description of soap. Practical and comprehensive instructions on the modern methods employed in their manufacture are given. In addition to the exhaustive directions for the manufacture of all kinds of soap both by boiling and the cold and semi-warm processes, numerous formulas of stocks available for the purpose are also included, as well as receipts for washing powders, liquid soaps, medicated soaps and other soap specialties. Nothing has been omitted in the preparation of this comprehensive and exhaustive work.

**BRANNT, WILLIAM T., and WAHL, WILLIAM H.** Techno-Chemical Receipt Book. 495 p. 12 mo il. \$2.00

Containing several thousand receipts, covering the latest, most important and most useful discoveries in chemical technology, and their practical application in the arts and the industries.

**BREARLEY, ARTHUR, and BREARLEY, HARRY.** Ingots and Ingot Molds. 218 p. 8 vo il. 1918. \$5.75

**Contents:** Introductory note. Crystalline structure and its effects; Shrinkage and contraction cavities. Casting temperatures. Ingot molds; Methods of casting. Sound ingots. Blow holes. Segregation. Slag occlusions. Influence of ingot defects on forged steel. Index.

**BREARLEY, HARRY.** Case-hardening of Steel. 164 p. 8 vo il. 1914. \$4.50

**Contents:** History and meaning of cementation. Structural changes in the core. Fiber and lamination in the core. Properties and defects of hardened cases. The carburizing operation. Case hardening steels. Carburizing reagents. Methods of testing. Automobile shells. Hardening and tempering. Surface hardening without cementation.

**BREARLEY, HARRY.** Heat Treatment of Tool Steel, an illustrated description of the physical changes and properties induced in tool steel by heating and cooling operations. 223 p. 8 vo il. 1916. \$4.50

**Contents:** Structure and classification. Crucible steel. Raw materials. Properties of ingots. Fractures and external appearances. Forging tool steel. Annealing. Physical changes in steel. Hardening. Tempering and straightening. Hardening typical tools. Defective tools. Hardening plant. Pyrometers. Alloy steels. Appendixes.

**BRINTON, W. C.** Graphic Methods for Presenting Facts. 371 p. 8 vo il. 1914. \$4.00

**Contents:** Component parts. Simple comparisons. Simple comparisons involving time. Time charts. Curve plotting. Comparison of curves. Component parts shown by curves. Cumulative curves. Frequency curves. Map presentations. Maps and pins. Curves for the executive. Records for the executive. Corporation financial reports. General methods. A few precautions.

**BROMLEY, HENRY ALDOUS.** Outlines of Stationery Testing. A Practical Manual. 74 p. 12 mo il. 1913. \$1.25

**Contents:** Introductory. Paper. Its physical examination. Paper: Its microscopic examination. Paper. Its chemical examination. The characteristics and requirements of special papers. Parchments, vellums.

**BROMLEY, HENRY ALDOUS.** Paper and Its Constituents: A Manual of Technical Methods Containing Chemistry and Analysis of Raw Materials, Paper-Making Fibers, Bleaching, Sizing and Carding Agents and Duststuffs; Microscopy, and Physical and Chemical Properties of Papers. 240 p. il. 8 vo. 1920. \$6.00

**Contents:** Part I. Cellulose—The Common Paper-making Fibers. Part II. General chemistry for paper makers. Analysis of raw materials. Bleaching agents and bleaching. Sizing agents and sizing. Mineral filling and loading agents; Mineral pigments. The synthetic dyestuffs; Lake pigments. Mill water and its analysis. Part III. The Microscopy of Paper. The physical properties of paper; The chemical properties of paper; The quantitative chemical analysis of paper. Special classes of paper. Index.

**BROOKS, BENJAMIN T.** The Chemistry of the Non-benzoid Hydrocarbons and Their Simple Derivatives. To be published by The Chemical Catalog Co., Inc. Ready about Nov. 1, 1921. 450 to 500 p. \$6.00

**Contents:** The paraffins; Occurrence in nature; Formation; Chemical properties; The paraffin hydrocarbons. The ethylene bond; The preparation of olefines; The unsaturated hydrocarbons. Polymerization of unsaturated hydrocarbons; General methods of synthesis of cyclic non-benzoid hydrocarbons; The sesquiterpenes; Rearrangements; Physical properties; Physiological and related properties.



**BROWN, HAROLD.** Rubber, Its Sources, Cultivation and Preparation. 237 p. 8 vo. il. 1916. \$2.50

CONTENTS. Rubber in British Africa. The principal rubber yielding plants; Latex. The tapping of rubber plants. The preparation of rubber. The chemistry of rubber. Statistics of consumption and prices. The Para rubber tree. The Ceara rubber tree. The African rubber tree. The African rubber vines. The Central American rubber tree. The Assam rubber tree. Other species.

**BROWN, MAROLD WARNER.** Electrical Equipment. 229 p. 8 vo. 1917. \$2.50

Unique in that it attacks the subject from the standpoint of the mechanical engineer. In addition to discussions of motors, generators, transformers, distribution systems, controlling and regulating apparatus, lighting arresters, measuring and indicating devices, there are chapters on storage batteries, illumination, the kinds of motors best adapted to particular purposes and costs, as well as a number of problems such as are met in actual practice. To facilitate study, data references are confined mainly to the *Standard* and the *American* handbooks, while Alexander Gray's *Principles and Practice of Electrical Engineering* is depended upon for theory. The work is based upon a set of notes used by the author in his work as instructor in Cornell University.

**BROWN, NELSON C.** Forest Products. Their Manufacture and Use. 471 p. 8 vo. 120 figures. \$4.00

A valuable reference book, giving briefly the chief commercial features of the principal forest industries, except lumber. The author obtained much of the data as a result of personal investigation and inspection of operations during trips to the South, the Lake States, the Northeast, and the far West. Trips to various European countries also resulted in the collection of materials included in the text. Brief bibliographies at the end of each chapter.

CONTENTS. General. Wood, pulp and paper. Tanning materials, Veneers, Slack cooperage, Tight cooperage, Naval stores. Hardwood distillation. Softwood distillation. Charcoal, Boxes and box shooks, Crosssties, Poles and pilings, Posts, Mine timbers, Fuelwood, Shingles and shakes, Maple syrup and sugar, Rubber, Dye woods and materials, Excelsior, Cork.

**BROWN, W. NORMAN.** The Art of Enamelling on Metal. Second edition, revised. 60 p. 12 mo. il. 1914. \$2.00

CONTENTS. Vitriifiable pigments, History, Cloisonne and Champs Levé ensembles, Painted ensembles, Preparing the plate, Composition and preparation of enamels, Designs for Cloisonne and painted ensembles.

**BROWN, W. NORMAN.** Handbook on Japanning for Ironware, Tinware, Wood, etc. Second edition, revised and enlarged. 76 p. 12 mo. il. \$2.00

CONTENTS. Introduction, Japan grounds, Japanning or enamelling metals, The enamelling and japanning store, Pigments suitable for japanning with natural lacquer, modern methods of japanning with natural Japanese lacquer, Colors for polished brass, Processes for tin plating, Galvanizing.

**BROWN, WM. A.** The Portland Cement Industry. A practical treatise on the building, equipping and economical running of a Portland cement plant. With notes on physical testing. 168 p. 8 vo. il. 1917. \$3.00

CONTENTS. Introductory, Historical, Development of the industry, Manufacture, Raw materials, Design and construction of a modern Portland cement plant, The rotary kiln, Power plants, Miscellaneous, Costs and statistics, Equipment, Development of cement testing, Chemical composition, Fineness, Tensile strength, Time of setting, Soundness or constancy of volume.

**BROWNE, C. A.** A Handbook of Sugar Analysis. A practical and descriptive treatise for use in research, technical and control laboratories. 888 p. 8 vo. il. 1912. \$6.00

This book includes the occurrence, methods of preparation, properties and reactions of the different sugars and their allied derivatives.

CONTENTS. Part I—Physical and Chemical Methods of Sugar Analysis, Sampling, Moisture determinations, Refractometry, Polarimetry, Saccharimetry, Miscellaneous methods. Part II—Descriptive Classification of the Sugars and Their Formations in Nature.

**BROWNING, P. E.** Introduction to the Rarer Elements. By Philip E. Browning, Ph.D., Assistant Professor of Chemistry, Kent Chemical Laboratory, Yale University. Fourth edition, thoroughly revised. 250 p. 8 vo. 1917. \$2.50

CONTENTS. The alkalis, Beryllium, Radioelements, Rare earths, Gallium, indium, thallium, titanium, zirconium, vanadium, niobium, tantalum, molybdenum, tungsten, uranium, selenium, tellurium, platinum metals, Gold. Rare gases of the atmosphere. Technical applications. Qualitative separation. Spectroscopic tables.

**BRUCE, EDWIN M.** Detection of the Common Food Adulterants. Third edition, revised and enlarged. 95 p. 16 mo. 1917. \$1.40

CONTENTS. Dairy products, Meat and eggs, Cereal products, Leavening material, Canned and bottled vegetables, Fruits and fruit products, Flavoring extracts, Saccharine products, Spices, Vinegar, Fats and oils, Beverages.

For this edition the book has been greatly enlarged and added to, so that it now contains the latest and most approved tests for the adulterants. It aims to give the qualitative tests for the purity of various foods, and includes a list of the more common adulterants.

**BRUNNER, R.** Manufacture of Lubricants, Shoe Polishes and Leather Dressings. Such as axle and machinery greases, oils, machinery oils, clockmakers' oils, as well as shoe polishes. Translated from the sixth German edition by Charles Salter. 170 p. 12 mo. il. \$3.50

**BRUNSWIG, H.** Explosives. By Dr. H. Brunswig. Translated and Annotated by Charles E. Munroe, Ph.D., and Alton L. Kibler, M.S., George Washington University. 350 p. 8 vo. il. 1912. \$3.50

The material is presented for convenient reference and future use. A synoptic and critical treatment of the literature of the subject as gathered from various sources.

CONTENTS. General behavior of explosive systems. Conditions governing explosive reactions. Rate of increase of pressure. The maximum explosive pressure. Temperature of explosions. The gases from

explosive reactions. Characteristics of particular explosives. Changes in explosives, igniters, fuses and detonators. Mercury fulminate. Propellants. Hints on handling, application and destruction of explosives.

**BRUSH, GEORGE F.** Manual of Determinative Mineralogy. With an introduction on blowpipe analysis. Revised and enlarged by S. I. Penfield. 312 p. 8 vo. il. 1907. \$3.50

The sixteenth edition of this standard work. Professor Penfield has compiled completely new tables for the determination of minerals. Contents. Introduction. Apparatus and reagents. Reactions of the elements. Tabular arrangement of reactions. Physical properties of minerals. Tables for the determination of mineral species. Indexes.

**BUCHANAN, J. F.** Brass Founders' Alloys. A practical handbook for the guidance of manufacturers and tradesmen. 129 p. 12 mo. il. 1911. \$1.50

CONTENTS. Introduction. Uses and characteristics of the common metals. Some peculiarities of alloys. Common methods of making alloys. Brass founders' alloy. The modern alloys. Miscellaneous alloys and tables. Index.

**BUEHLER, F. A.** Filters and Filter Presses for the Separation of Solids and Liquids. 184 p. 8 vo. il. 1914. \$5.00

With additional matter relating to the theory of filtration and filtration in sugar factories and refineries, by John Joseph Eastick, F. I. C., A. R. S. M. The authors discuss the methods of the various types of filters and suitable methods of arranging them to minimize labor and space. They also consider the theory of filtration and describe the preparation of the solutions for filtration, the substances used as aids to filtration and the precautions to be taken.

**BULLENS, DENISON K.** Steel and Its Heat Treatment. Second edition, thoroughly revised. 184 p. 8 vo. il. 1918. \$4.00

Second edition has about fifty additional pages of illustrations and information of a practical nature, especially concerning forging and annealing and the "human element."

CONTENTS. The testing of steel. Heat generation. Heat application. The human element. Forging. The structure of steel. Annealing. Hardening. Tempering and toughening. Case carburizing. Case hardening. Thermal treatment. Carbon steels. Nickel steels. Chromium steels. Chromium nickel steels. Vanadium steels. Manganese, silicon, tungsten, and molybdenum steels. High-speed steels. Tool steel and tools. Miscellaneous treatments. Pyrometers and critical range determinations. Index.

**BULLOCK, WM.** Timber: From the Forest to Its Use in Commerce. (Pittman's Common Commodities and Industries.) 149 p. il. 12 mo. 1920. \$1.00

CONTENTS. Introduction, Notes on the history of timber as connected with Great Britain, The coniferous trees of commerce, European and other Eastern species in use at the present time. The coniferous timbers of Canada and other countries in the Western hemisphere, The hardwood or broad-leaf section of trees. The mahoganies of commerce, Some account of the different varieties of mahogany, The mahogany products of the West Coast of Africa. The European varieties of hardwoods commonly in use. Hardwood timbers from Asiatic sources, The hardwood timbers of Japan and the Australasian colonies, Some account of the hardwood timbers of Canada and the United States that are supplied to British markets, The hardwood timbers of Central and South America, Some notes on the extraction of timber in various countries; The outlook for future supplies.

**BURGESS, C. F., and CRAVENS, G. W.** Applied Electrochemistry and Welding. 132 p. 8 vo. il. 1917. \$1.50

A practical treatise on commercial chemistry, the electric furnace, the manufacture of ozone and nitrogen by high tension discharges, and the applications of electric, gas, and chemical welding to manufacturing and repair work.

**BURGESS, G. K., and LE CHATELIER, H.** The Measurement of High Temperatures. By G. K. Burgess, Bureau of Standards, and H. Le Chatelier, Membre de l'Institut. Third edition, rewritten and enlarged. 510 p. 8 vo. il. 1912. \$5.00

This book will and the engineer who desires to adapt some method or instrument to his particular technical investigation, the investigator who requires accurate methods of measurement, and the student to whom fundamental principles are of prime interest.

CONTENTS. Standard scale of temperatures. Pyrometers. Calorimetric pyrometry. The laws of radiation. Various pyrometric methods. Standardization of pyrometers. Bibliography.

**BURGESS, PAUL S.** Soil Bacteriology Laboratory Manual. 123 p. il. 12 mo. 1914. \$1.25

CONTENTS. Individual apparatus, General apparatus, Laboratory rules, Practice, Humification of organic matter, Practice, Cellulose fermentation, Practice, Isolation in pure culture of bacteria causing cellulose fermentation, Practice, The bacterial "count" of soils, Practice, Ammonification in solutions ("Remy's Method"), Practice, Ammonification in soils ("Baker's Method"), Practice, The ammonification of dried blood by pure cultures in soils, Practice, The ammonification of urea, Practice, Nitritation in solutions ("Remy's Method"), Practice, Isolation of the nitrite producing organisms by the "Gypsum Block Method", Practice, Nitritation in soils ("Baker's Method"), Practice, The influence of moisture content on nitritation in soils, Practice, The influence of soluble organic matter on nitritation in soils, Practice, Denitrification in solution, Practice, Sulphate reduction by soil bacteria, Practice, Aerobic non-symbiotic nitrogen fixation by soils in solution, Practice, The isolation of pure cultures of Azotobacter, Practice, Non-symbiotic nitrogen fixation in soils ("Baker's Method"), Practice, Symbiotic nitrogen fixation by pure cultures of Azotobacter, Practice, The effect of varying reaction of the soil on non-symbiotic nitrogen fixation, Practice, Anaerobic fixation of the soil on non-symbiotic nitrogen fixation, Practice, and study of Bacillus radicicola from the nodules of different legumes; Practice, The iron bacteria, Practice, Growth and study of soil protozoa, The controlled growth of legumes, inoculated and uninoculated, Appendix A. Cleaning and sterilizing glassware, The sterilization of soil, The sterilization of seeds, Appendix B. Preparation of culture media, Appendix C. Preparation of stains and methods of staining, Simple stains, Simple staining, Gram staining, Moller's method of simple staining, Hiss' method of capsule staining, Appendix D. Chemical methods, Humus determination, Determination of ammonia, Determination of nitrates, Total nitrogen, Qualitative test for nitrates, Qualitative test for nitrites, Qualitative test for ammonia, Appendix E. Koch's plate culture method, Appendix F. The growth of plants under controlled conditions, Appendix G. Stock cultures, Appendix H.

Table of autoclave pressures and temperatures; Comparative table of weights and measures. Appendix F. Comparison of Centigrade and Fahrenheit thermometer scales.

**BUTLER, EDWARD.** Modern Pumping and Hydraulic Machinery. As Applied to all purposes, With Explanation of the Theoretical Principles Involved, Construction, Working, and Relative Advantage. 473 p. 8 vo. il. 1913. \$3.50

The author presents in a clear and concise form information especially useful to practical engineers, designers, and others engaged either in the construction or application of pumping and hydraulic machinery.

**CONTENTS:** Introductory remarks. Early direct-acting steam pumping engines. Waterworks pumping engines, direct-acting duplex class. Differential non-rotative pumping engines. Mine pumps, force pumps, and sinking pumps. Suction and delivery valves. Boring appliances for artesian tube wells. Artesian well or borehole plunger and air-lift pumps. Appliances for raising petroleum from artesian or borehole wells. Boiler feed and general service plunger pumps. Injectors, jet pumps and ejectors. Vacuum and condenser pumps. Hydraulic power pumps, ram pumps and steam, air and gas-power displacement pumps. Fire pumps and high-speed plunger pumps. Variable delivery pumps and carriageable transmission by hydraulic power. Masscutte, rotary, oscillating and wind-power pumps. Low lift and high-lift centrifugal pumps. Hydraulic power wheels. Index.

**BUTLER, EDWARD.** Oil Fuel. Its Supply, Composition, and Application. Third edition, greatly enlarged. 328 p. 12 mo. il. 1914. \$3.75

**CONTENTS:** Origin, production, and sources of supply. The economic aspect and heat value of liquid fuel. Chemical composition of fuel oils. Conditions of combustion in oil fuel furnaces. Early combustion methods for oil fuel. Steam, air, and pressure jet burners, etc., used in land and marine boilers. The relative advantages of steam, compressed air, and mechanical action as an atomizing agent for liquid-fuel burners. Oil fuel for marine purposes. Oil fuel for naval purposes. Oil fuel on locomotives. Oil fuel for road vehicles and motor launches. Oil fuel for metallurgical and other purposes. Oil fuel for lighting and domestic purposes. Index.

**BUTLER, G. M.** A Pocket Handbook of Minerals. Designed for use in the field or class room with little reference to chemical tests. Second edition. 311 p. 8 vo. il. \$3.00

**CONTENTS:** Native elements. Sulphides of semi-metals and molybdenum. Sulphides, etc., of the metals. Sulpho-salts. Halogen salts. Oxides. Anhydrous oxides of the semi-metals. Anhydrous oxides of the metals, hydrous oxides. Anhydrous carbonates. Hydrous carbonates. Anhydrous silicates. Hydrous silicates. Titanosilicates. Columbanes and tantalates, phosphates, arsenates, and vanadates. Borates. Uranates. Anhydrous sulphates, chromates, etc. Hydrous sulphates, tungstates and molybdates. Hydrocarbons, commercially important ores. Values of metals and minerals. Glossary. Moh's scale of hardness. Von Kobell's scale of fusibility. Index of minerals. Determinative tables.

**BUTLER, G. MONTAGUE.** Pocket Handbook of Blowpipe Analysis. Designed for the use of students and prospectors with the idea of making oral instruction unnecessary. First edition, corrected. 12 mo. Cloth. 85 p. 1916. \$1.00

**CONTENTS:** Blowpipe instrument. Reagents and operations. Methods of testing for the various elements with the blowpipe. Outline for qualitative blowpipe analysis. Index to all of the tests yielded by the various elements. The determination of minerals by means of the blowpipe. The elementary principles of chemistry. Table of elements with their symbols and atomic weights. Index.

**BUTLER, GORDON MONTAGUE.** Handbook of Mineralogy, Blowpipe Analysis and Geometrical Crystallography. 16 mo. il. 1918. \$3.50

**CADY, HAMILTON P.** General Chemistry. (International Chemical Series.) 522 p. 12 mo. il. 1916. \$3.25

An abridgement and simplification intended for classes which have less time to devote to the subject than those for whom the "Inorganic Chemistry" was intended.

**CADY, HAMILTON P.** Inorganic Chemistry. (International Chemical Series.) 606 p. 8 vo. il. 1912. \$3.50

This textbook is a distinctive attempt to make an advance in methods of instruction. It is the result of a logical rearrangement of the subject matter which has been tried out by the author for several years in his classroom work.

**CAHEN, EDWARD, A.R.C.S., and WOOTTON, WILLIAM ORD, A.R.C.S., B.S.C. (Lond.).** The Mineralogy of the Rarer Metals with foreword by F. W. Harbord, A.R.S.M., F.I.C. Second edition. 211 p. 16 mo. Limp leather. 1919. \$4.00

The authors of this handbook have adopted Dana's classification and have compressed into the smallest possible space all the latest available facts, thus placing in the hands of the prospector, in an accessible form, information which cannot fail to be of considerable value at home and in the field.

**CONTENTS:** Introduction. International atomic weights. Periodic table. Order of classification. Classification according to Dana. Table of abbreviations. Table of hardness. The alkali metals. Lithium, rubidium, caesium. Beryllium or glucinum. Cerium. The rare earths, cerium, lanthanum, praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, scandium, yttrium, gallium, germanium, indium, molybdenum, niobium and tantalum. Platinum group of metals, ruthenium, rhodium, palladium, osmium, iridium, platinum, scandium, selenium, tellurium, thallium, thorium, titanium, tungsten, uranium, vanadium, yttrium, zirconium. Geographical distribution. Assaying. Analysis of minerals in the field. Index.

**CAIN, J. C.** Chemistry and Technology of the Diazo Compounds. Second edition. 199 p. 8 vo. 1920. \$4.20

**CONTENTS:** Preparation of the diazo-compounds. Mechanism of the diazotising process. Reactions of the diazo compounds. Actions of various reagents on diazo-compounds. Formation of diphenyl derivatives. Interchange of groups. Action of light. Diazoamino compounds.

Azo-compounds. Metallic diazo-derivatives. Diazo-compounds of the aliphatic series. Heterocyclic diazo-compounds. Constitution of the diazo-compounds. Index.

**CAIN, JOHN CANNELL.** Manufacture of Intermediate Products for Dyes. Second edition. 273 p. 8 vo. 1919. \$4.50

**CONTENTS:** Introduction. Benzene series. Chloro- and chloronitro derivatives. Sulphonic acids. Nitro-compounds. Amino compound, Primary, secondary and tertiary bases and their chloro-, nitro-, and sulphonic derivatives. Diamino compounds and their nitro-, nitroamino and sulphonic derivatives. Phenols and their nitro-, Nitroamino and sulphonic derivatives. Benzaldehyde and its chloro-, nitro-, hydroxy-, and sulphonic derivatives. Carboxylic acids and their derivatives (Dehydroxytartaric acid); Pyrazolones. Naphthalene Series. Nitroamino-naphthalenes. Naphthalenesulphonic acids. Naphthylamines. Naphthylamine-sulphonic acid; Naphthols. Nitroso B. Naphthol. Naphtholsulphonic acids; Dehydroxynaphthalene and sulphonic acids. Amino-naphtholsulphonic acids. Naphtholcarboxylic acids and other derivatives. Acenaphthenequinone. Anthracene Series. Anthraquinone and its chloro-, nitro-, amino and sulphonic derivatives. Quinizarin and anthrarufin; Methyl-anthraquinone and its derivatives. Benzanthrone. Appendix. Index.

**CAIN, JOHN CANNELL, and THORPE, JOCELYN FIELD.** The Synthetic Dyestuffs and the Intermediate Products from which they are derived. 443 p. 8 vo. il. 1913. \$6.50

**CONTENTS:** Part I—Theoretical. Coal-tar: Its occurrence and purification. Nitration. Sulphonation. Amido compounds. Hydroxyl compounds (Carboxyl compounds and aldehydes). Application of the dyestuffs, classification of the dyestuffs. The nitroso dyestuffs. The nitro dyestuffs. The azo dyestuffs. Acridine dyestuffs. Anthracene dyestuffs. Diphenylamine dyestuffs. Quinazoline dyestuffs. Thiazol dyestuffs. Quinoline dyestuffs. Indigo. The sulphur or sulphide colors. Xanthone dyestuffs. A short history of the synthetic coloring matters.

Part II—Practical. The technical laboratory. Preparation of intermediate products. Preparation of dyestuffs, etc.

Part III—Analytical. Intermediate products. The application of the coloring matters. The valuation of a coloring matter. The quantitative and qualitative analysis of dyestuffs. Investigation of dyestuffs on the fiber. Appendix. Index.

**CAIN, W.** Brief Course in the Calculus. With figures and diagrams. Second edition, revised. 290 p. 8 vo. il. 1911. \$1.75

**CALVERT, A. F.** Salt. (Pitman's Common Commodities and Industries.) 151 p. il. 1910. \$1.00

**CONTENTS:** The chemistry and properties of salt. The beginnings of the salt industry; The Cheshire wicks. Development of brine processes. Formation and extent of the Cheshire deposits. The Cheshire subsidence; Latest methods of salt making. The salt market.

**CALVERT, G. T.** The Manufacture of Sulphate of Ammonia and Crude Ammonia. Second edition, revised and enlarged. 105 p. 8 vo. il. 1911. \$4.00

**CONTENTS:** Sulphate of ammonia, its composition and analysis; The raw materials, ammoniacal liquor, sulphuric acid and lime. Plant required for the manufacture of sulphate of ammonia. A detailed description of the apparatus and processes used; Starting, working and stopping the plant. Difficulties and their remedies. Cost of manufacture of sulphate of ammonia. Manufacture of crude ammonia or concentrated ammoniacal liquor. Manufacture of sulphate of ammonia in small works. Design of a sulphate of ammonia house—comparisons of ammoniacal liquors. Sulphuric acid table.

**CAMPBELL, ANDREW.** Petroleum Refining. With a foreword by Sir Boverton Redwood, Bart. 313 p. 8 vo. il. 1918. \$8.50

**CONTENTS:** Examination of the crude oil. General departments; Storage of crude oil and liquid products. Distillation. Paraffin extraction and refining; Candle manufacture. Chemical treatments. Distribution of products. Engineering specifications. Appendix.

**CAMPBELL, N. R.** The Elements of Physics. 565 p. 4 to. 1920. \$12.50

**CONTENTS:** The Nature and Recognition of Chemical Change. The Classification of Substances into Complex and Simple (Elements). Classification of Complex Substances into Mixtures and Compounds. The Part which Air Plays in Combustion. The Conservation of Mass. The Law of Fixed Ratios. The Law of Multiple Ratios. Combining or Equivalent Weights. The Law of Permanent Ratios. The Law of Combining Volumes.

**CAMPBELL, H. H.** Manufacture and Properties of Iron and Steel. By Harry Huse Campbell, Metallurgical Engineer for the Pennsylvania Steel Co., Mafyland Steel Co., and the Spanish-American Steel Co. Fourth edition. 639 p. 8 vo. il. 1896. \$6.00

This book has been a standard for metallurgists, steel manufacturers and students for a number of years.

**CONTENTS:** The main principles of iron and steel metallurgy. Pig iron. Wrought iron steel. Crucible steel. Acid Bessemer process. Basic Bessemer process. Open hearth process (acid and basic). Segregation. Specifications on structural material. Welding. Steel castings. Inspection. Errors in chemical records. The metallurgy of iron and steel. Primitive methods of making iron. The blast furnace. Wrought iron. Steel. High carbon steel. The acid Bessemer process. The Basic Bessemer process. The open hearth furnace. Fuel. The acid open hearth process. The Basic open hearth process. Special methods of manufacture and some items affecting the costs. Segregation and homogeneity. Influence of hot working on steel. Heat treatment. The history and shape of the test-piece. The influence of certain elements on the physical properties of steel. Classification of structural steel. Welding. Steel castings. The iron industry of the leading nations. Factors in industrial competition. The United States, Great Britain, Germany, France, Russia, Austria, Belgium, Sweden, Spain, Italy, Canada. Statistics. Appendix.

**CAMPBELL, LORN.** Oxyacetylene Welding Manual. 154 p. 8 vo. 92 figures. \$1.50

**CONTENTS:** Introduction; Apparatus; Operation; Shop equipment; Apparatus repairs; Preheating agencies; Welding of cast iron; Cast

iron; Steel welding; Brass welding; Aluminum welding; Welding of malleable iron; Oxyacetylene cutting; Carbon burning. Glossary.

**CAPEL, WILLIAM PARR, and CARPENTER, JEANNE DANIELS.** Municipal Housecleaning. The methods and experiences of American cities in collecting and disposing of their municipal wastes. 232 p. 8 vo. 1918. **\$6.00**  
Ashes, rubbish, garbage, manure, sewage and street refuse are discussed.

**CARDULLO, F. E.** Practical Thermodynamics. By Forrest E. Cardullo, M.E. 414 p. 8 vo. il. **\$4.00**  
**CONTENTS:** Introduction. The nature and measurement of heat. The thermal properties of gases. The expansion of gases. Thermodynamic processes and cycles. The thermal properties of vapors. Wet and superheated vapors. Mixtures of gases and vapors. The steam engine. Steam cycles. Losses in the steam engine. Notes on the design and testing of steam engines. The steam turbine. Condensing machinery. Combustion. The steam boiler. Boiler plant auxiliaries. Water-cooling apparatus. Hot air engines. The internal combustion engine. Notes on the design and performance of internal combustion engines. Gaseous fuels. Compressed air. Refrigeration. Heating. Ventilation, evaporation and drying. The temperature-entropy diagram. The kinetic theory of heat.

**CARNEGIE, D., and GLADWYN, S. C.** Liquid Steel Its Manufacture and Cost. By David Carnegie, assisted by Sidney C. Gladwyn. Second edition. 546 p. 8 vo. il. 1918. **\$10.00**

**CONTENTS:** Materials used in steel manufacture; The crucible process; The evolution of the Bessemer process; Manufacture of steel produced in the Bessemer process; The Bessemer process; The evolution of the Bessemer converter; Cost of steel produced in large Bessemer converters for ingots; Composition of charges employed and analysis and uses of steel produced in large Bessemer plants; Cost of steel produced in surface blown converter plants for steel foundries; The open hearth process; Cost of steel produced in typical large open hearth furnaces; Steel production in small open hearth furnaces; The Talbot continuous process; Composition of charges employed and analyses and uses of steel produced in the open hearth process; The electric process; The evolution of the electric furnace; Arc furnaces; Induction furnaces; Arc resistance furnaces; The chemical reactions in the electric furnace; Composition of charges employed and analysis of steel produced in the electric process; Development of electric steel manufacture in Canada; Costs and labor; Comparison of costs of liquid steel.

**CARR, W. M.** Open-hearth Steel Castings. 118 p. 16 mo. il. 1907. **\$1.50**

A complete exposition of the methods involved in the manufacture of open-hearth steel castings by the basic and acid processes. The work is compiled from a series of articles by the author, written for and published by the *Iron Trade Review* and the *Foundry*.

**CARRIER, W. H. (Editor).** Fan Engineering. 581 p. il. 16 mo. 1914. **\$3.00**

**CONTENTS:** Part I—Properties of Air. Part II—Applications. Heating, ventilation, air washing, cooling, humidifying, drying, mechanical draft, exhaust systems, and miscellaneous applications. Part III—Air Ducts. Part IV—Apparatus. Fans, fan testing, fan capacities, fan dimensions, heaters, air conditioning apparatus, steam engines, practical applications, and the selection of apparatus for heating and ventilating. Part V—Appendix.

**CASTELL-EVANS, JOHN, F.I.C., F.C.S.** Physico-Chemical Tables. Two volumes. Each complete in itself.

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**CONTENTS:** Introduction. Notes on the use of the tables. Part I.—Mathematical. Part II.—Mechanics. Part III.—Physics and physical chemistry. Heat. Thermometry. Correction of thermometric readings. Air or gas thermometers. Measurement of extreme temperatures. Change of dimensions dependent on variation of temperature. Calorimetry. Specific gravities and densities. Barometry. Thermal constants of gases. Calculations of gaseous volumes. Determination of vapor densities—specific gravity of gases. Fusion. Vaporization. Gases and vapors. Vapor tensions and boiling points.

548 p. 8 vo. Three-quarter leather. 1902. **\$12.00**  
Vol. II—Physical and analytical chemistry.  
**CONTENTS:** Part III.—Physics. Continued. Molecular dynamics, kinetic theory of gases, etc. Molecular speeds. Molecular volumes, etc. of liquids. Influence of temperature on surface tension, etc. Capillary constants of solutions. "Cryoscopic or lowering of freezing point" method. Vapor tension and "ebulliscent or boiling point" method. Distillation of mixed liquids. Part IV.—Analytical chemistry.

687 p. 8 vo. Three-quarter leather. 1911. **\$14.00**

**CHALKLEY, A. P.** Diesel Engines for Land and Marine Work. With an introduction by Dr. Rudolf Diesel. Fourth edition, revised and greatly enlarged. 380 p. 8 vo. il. 1916. **\$5.00**

**CONTENTS:** Expansion of gases. Adiabatic expansion. Isothermal expansion. Working cycles. Thermodynamic cycles. Constant temperature cycle. Constant volume cycle. Constant pressure cycle. Diesel engine cycle. Reasons for the high efficiency of the Diesel engine. Action and working:—Four cycle engine. Two cycle engine. Two cycle double acting engine. Horizontal engine. High speed vertical engine. Relative advantages of the various types of engine. Limiting power of Diesel engines. Fuel for Diesel engines. Construction:—Four cycle single acting engine; General arrangement. Starting and running. Description of four cycle engine. Valves and cams. Regulation of the engine. Types of four cycle engines. High speed engine. Horizontal engine. Two cycle engine. Air compressors for Diesel engines. Solid injection motors. Installing and running. Space occupied and general dimensions. Starting up the engine. Management of Diesel engines. Cost of operation of Diesel engines. Testing:—Object of testing. Test on 200 B.H.P. Diesel engine. Test on 300 B.H.P. High speed marine engine. Test on 500 B.H.P. engine. Test on high speed Diesel engine. Diesel engine for marine work, advantages. Design and arrangement of Diesel marine engines. Methods of reversing Diesel engines. Auxiliaries for Diesel ships. Horse power of marine Diesel engines. Weights of marine Diesel engines. The design of large engines. Construction:—Two cycle engine. Swiss type. Belgium types. Swedish type. German types. British types. Four

cycle engine. Dutch type. German types. Danish type. Russian types. Small Diesel engines. Design:—Cylinders and cylinder covers. Pistons. Cylinder dimensions. Crank shafts. Air compressors. Scavenging pumps. The future of the Diesel engine.

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**CHALMERS, T. W.** The Production and Treatment of Vegetable Oils. By T. W. Chalmers, B. Sc., A. M. I. Mech. E. On the Editorial Staff of "The Engineer." 155 p. 4 to. 1918. **\$7.50**

**CONTENTS:** Introductory and general; The principal vegetable oils; Preparatory machinery for copra and linseed; Preparatory machinery for palm fruit and palm kernels; Preparatory machinery for cotton seed and castor seed. Some special forms of reduction machinery. Meal kettles, receiving pans and moulding machines. Oil presses—Anglo-American type. Oil presses—cage type; The general arrangement of oil mills; Extraction of oil by chemical solvents; The refining of oils; The hydrogenation or hardening of oils; The generation of hydrogen for oil hardening purposes. The manufacture of soap. Glycerine recovery and refining and the splitting of oils.

**CHAMBERLAIN, I., and QUILTER, I. H.** Knitted Fabrics. (Putnam's Common Commodities and Industries.) 145 p. il. 1920. **\$1.00**

**CONTENTS:** Historical; Operations preparatory to knitting; Principles of knitted fabrics; Hand knitting machines and knitting operations. Manufacturing of hosiery. Manufacturing of knitted underwear. Manufacturing of fancy fabrics and outer garments. Trimming and finishing of knitted fabrics.

**CHAMBERLAIN, JOSEPH S.** Organic Agricultural Chemistry. 319 p. 8 vo. 1919. **\$2.00**

Designed for use with students of agriculture, to give them enough chemical instruction to enable them to understand the problems of agricultural practice.

**CHAMBERS' Mathematical Tables, Consisting of Logarithms of Numbers 1 to 108,000, Trigonometrical, Nautical and other Tables.** Edited by James Pryde. New edition. 496 p. 12 mo. **\$2.50**

**CHAMOT, E.** Elementary Chemical Microscopy. By Emile Monnin Chamot, B.S., Ph.D., Professor of Sanitary Chemistry and Toxicology, Cornell University. vi+410 p. 8 vo. il. 1915. **\$3.50**

A book which outlines the manipulation of the microscope in the chemical laboratory and which shows how its use will serve to shorten the work of the analyst and render his results more accurate.

**CHAPPEL, E.** Five Figure Mathematical Tables. 340 p. 8 vo. 1916. **\$2.50**

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**CHARNOCK, G. F.** Mechanical Technology. 645 p. 8 vo. il. 1915. **\$3.50**

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Extrusion of metals; The manipulation of sheet metals by flanging, drawing, drawing, embossing, etc.; The drawing press and examples of work; Coining press.

**CHAUVENET, REGIS.** Chemical Arithmetic and Calculation of Furnace Charges. 302 p. 8 vo. 1912. \$4.00

This volume forms a manual for reference as well as a text for the student. Although bound into one volume it is really two treatises; many principles given in the first part find application on the second. Numerous examples are given, and the exposition throughout is so simplified that it is readable by any person fairly versed in elementary chemistry.

**CONTENTS:** Part I.—Preface. Introduction. Fundamental laws of chemistry. Definitions. Preliminary remarks. Thermometers. Metric system. Tables of metric system. Problems in the metric system. Ordinary weights and measures. Conversion, metric to ordinary and reverse. Mensuration data and examples. Chemical problems. The chemical equation and examples. Deduction of analysis from formula. Deduction of chemical factors and examples. Deduction of formula from analysis and examples. Excess and deficiency. Atomic and molecular weights. Vapor densities as related to molecular weights. Raoult's law. Freezing and boiling points of solutions. Computation of gas volumes. Deduction of gas volumes from weights. The "Crith" method. The "22.4" method and examples. Application of the "22.4" method to English measures. Problems involving all preceding principles. Density of gases when air is "unity." Charles' law. Boyle's law. Combination of Charles' and Boyle's laws. Weights of gases under various conditions. Specific gravity. Substance heavier than water—Substance soluble in water. Substance lighter than water—Liquid substance—Bottle method. Specific gravity of a mixture. Miscellaneous problems in specific gravity. Calculation of analyses and examples. Mineral waters. Assay weights and calculations. Mexican assay returns. Volumetric analysis and examples. Miscellaneous problems. Answers to miscellaneous problems. Table of elements and atomic weights. Table of chemical factors. Table of molar weights and percentage composition. Table of specific gravities, melting point, etc. Table of gases and vapors, densities, etc. Table of specific gravity of water at various temperatures. Specific gravities of certain liquids: Ammonia, sulphuric acid, hydrochloric acid, nitric acid. Part II.—Calculation of furnace charges. Definitions. Formulistic slags. Introductory problems. Calculation by "excess." Taking out matte. Simplification of data. Conversion factors for bases. Mixing ores. Concentration. Proportional and percentage tables. Formulistic and percentage slags. Method of "representative" equations. Typical slag problem (from Peters). Iron furnace problem. Type slags. Indeterminate cases. Pyritic smelting. Some well known formulæ. Burdening the iron furnace. Index.

**CHEMICAL ABSTRACTS.** Decennial index to vols. 1-10. 4 vols. 8 vo. 1917-1918. \$15.00

This index is indispensable to the working chemist. It covers the years 1907 to 1916.

**CHEMICAL DICTIONARY.** (See Condensed Chemical Dictionary).

**CHEMICAL SOCIETY.** (London). Annual Reports on the Progress of Chemistry. Vols. I to XV. 1904-1918. Each. \$3.00

Since 1904 these "Reports" have given systematic data on the advances made each year in the various departments of chemistry for the benefit of all workers, students or teachers or those chemists who are engaged in technical or manufacturing applications of chemistry.

**CHEMICAL SOCIETY MONOGRAPHS.** See American Chemical Society Monographs.

**CHRISTIE, W. W.** Boiler-waters, Scale, Corrosion, Foaming. 242 p. 8 vo. \$3.00

**CONTENTS:** Water, Its Properties; Materials Found in Water; Water Analysis; Boiler; Scale; Transmission of Heat; Conductivity of Solids; Corrosion; Feed Water Pipes, Blow-Off Pipes; Tubes; Priming and Foaming; Oil, Grease; Zinc; Hardness of Water; Feed-Water Heaters; Economizers; Water softening; Tables.

**CHRISTIE, WILLIAM W.** Water, Its Purification and Use in the Industries. 230 p. 12 mo. il. 1912. \$3.00

**CONTENTS:** Sources of water. Impurities; Uses, reagents. Water softening: cold process systems; hot process systems. Results accomplished by softening system. Pressure filters. Aeration. Sterilization. Ozon. Ice. Drinking water. Open filters. Alum. Chloride of lime. Tannin. Measurement of water. Oil filters. Boiler water. Miscellaneous tables.

Contains general information regarding water together with tables of value to users of water for manufacturing and industrial purposes, so written as to present the technical aspect of the subject, describing the various machines and apparatus without referring to them by their makers' names.

**CHRISTOPHER, J. E.** Coal Distillation, Gasification, and By-products. 90 p. 8 vo. il. 1915. \$2.00

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**CHRISTOPHER, J. E., and BYROM, T. H.** Modern Coking Practice. 2 vols. 8 vo. il. each \$3.00

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rect and semi-direct processes of ammonia recovery. VII.—Distillation of tar. VIII.—Benzol. IX.—Surplus power, etc. X.—Gas analysis, pyrometry, etc.

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Below is a specimen page, reduced to two-thirds actual size:

Abelmoschus	9	Acetaldehyde
Abelmoschus (Musk-mallow, Musk seed. Amber seed, Ambrette). Derivation: Seeds of Abelmoschus Habitat: Egypt, India and Tropical America. Containers: Bags. Grades: Technical. Uses: Manufacture of perfumes, adulterating musk, preserving woolens from moths. Fire hazard: None. Railroad shipping regulations: None. Abietic Acid. See Acid abietic. Abietic Acid. See Acid abietic. Abraxas. See Alundum, Burrstone, Carborundum, Corundum, Emery, Garnet, Grindstone, Kieselguhr, Mill stone, Novaculite, Glaston, Pumice, Scythestone, Tripoli, Volcanic ash, Whetstone. Abraxas. See Alundum, Burrstone, Carborundum, Corundum, Emery, Garnet, Grindstone, Kieselguhr, Mill stone, Novaculite, Glaston, Pumice, Scythestone, Tripoli, Volcanic ash, Whetstone. Derivation: A mixture of potassium and magnesium chlorides and sulfates and other salts, overlying the rock-salt deposits at Stassfurt, Germany. This mineral was most important source of potash salts prior to 1914. Fire hazard: None. Railroad shipping regulations: None. Abalanthin* (Absinthin, Absynthin) C <sub>15</sub> H <sub>22</sub> O <sub>8</sub> H <sub>2</sub> O Color and properties: Yellowish-brown, amorphous powder, very bitter taste. Constants: Melting-point 120°-125°C. Soluble in alcohol and chloroform, insoluble in water. Derivation: From Artemisia absinthium. Method of purification: Crystallization. Grades: Technical. Containers: Glass bottles. Uses: Medicine. Fire hazard: None. Railroad shipping regulations: None. Absinthium* (Wormwood) Derivation: Leaves and tops of Artemisia absinthium. Habitat: Europe, Northern and Western Asia, and Africa; cultivated in U. S. Containers: Bags; boxes. Grades: Technical. Uses: Medicine. Fire hazard: None. Railroad shipping regulations: None. Absinthe Oil. See Wormwood oil. Absynthin. See Absinthin. Acacia. Derivation: Gummy exudation from Acacia senegal and other species of Acacia. Habitat: Africa, Arabia and India. Containers: Wooden kegs; tins.		Grades: Technical, U. S. P.; B. P. Uses: Medicine, adhesives. Fire hazard: None. Railroad shipping regulations: None. Acaciae Cortex, B. P. Acacia bark. Acaciae Gummi, B. P. (Acacia gum). See Acacia. Acanthite. A natural silver sulfide, Ag <sub>2</sub> S. It contains 87 per cent silver. Acenaphthene* (Ethylenenaphthene, Ethylenenaphthalene) C <sub>12</sub> H <sub>8</sub> (C <sub>2</sub> H <sub>2</sub> ) <sub>2</sub> . Color and properties: White needles. Constants: Specific gravity 1.0687; melting-point 95°C.; boiling-point 220°C. Soluble in hot alcohol. Derivation: From coal-tar. Containers: Wooden casks. Grades: Technical. Uses: Dye-stuff intermediates. Fire hazard: None. Railroad shipping regulations: None. Acetol. See Calcium permanganate. Acetal* (Diethylacetal, Ethylaldehyde, ethyl ether, Diethylaldehyde) (CH <sub>3</sub> CH(OC <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> ). Color and properties: Colorless, volatile liquid; agreeable odor; nutty after-taste. Constants: Specific gravity 0.831; boiling-point 103°-104°C. Soluble in water, alcohol and ether. Derivation: By the imperfect oxidation of ethyl alcohol. Method of purification: Rectification. Grades: Technical. Containers: Bottles, iron drums. Uses: Medicine, solvent. Fire hazard: None. Railroad shipping regulations: None. Acetaldehyde* (Ethyl aldehyde, Acetic aldehyde, Ethanol, Aldehyde) CH <sub>3</sub> CHO. Color and properties: Colorless, light, inflammable liquid, pungent, fruity odor. Constants: Specific gravity 0.801; boiling-point 20°C. Soluble in water, alcohol and ether. Derivation: (1) Commercially obtained (a) from "first runnings" of alcohol stills by fractionation in a special still; (b) by passing alcohol vapor over platinum black; (c) by synthesis from acetylene gas (a) By pouring a mixture of 90 per cent alcohol and concentrated sulfuric acid into a solution of potassium bichromate. The mixture is heated in a reflux apparatus and subsequently distilled. Method of purification: Rectification in a special type of still. Containers: Iron drums. Grades: Technical.

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**CROOKES, W.** *Select Methods in Chemical Analysis, (Chiefly Inorganic).* By Sir William Crookes, F.R.S. Fourth edition, rewritten and enlarged. 762 p. 8 vo. il. 1905. \$8.00

**CROSBY, EVERETT; FISKE, H. A., and FORSTER, H. W.** *Handbook of Fire Protection.* Sixth edition, revised and enlarged. 757 p. 12 mo. il. 1910. \$4.00

Contents: General. Fundamental principles of fire protection; Fire protection an engineering science; Relation of accident prevention to fire prevention; National fire protection association; National Board of Fire Underwriters; Underwriters' laboratories. Causes of Fire. Common fire causes; Dangerous substances found in manufacturing plants; Typical list of fire causes. Spread of fire. Retarding the spread of fire; Fire resisting construction; Slow burning construction (also known as mill construction); Structural improvements for existing buildings; Roofs and roof coverings; Protection of wall openings (including partitions); Building codes. Construction for special occupancies. Department stores, Dwellings; Garages; Hotels; Office buildings; Schools; Theatres. Extinguishment of fire. Public fire departments (and high pressure systems); Water supply for private protection; Outside private protection; Interior fire extinguishing apparatus.



(exclusive of automatic sprinklers): Automatic sprinkler protection; Rules and requirements for automatic sprinkler systems; Alarm valves for automatic sprinkler systems; Dry pipe valves for automatic sprinkler systems; Sypho chemical sprinkler system and service; Open sprinklers; Signaling systems and watchman service. *Miscellaneous*: Egress facilities and drills; Self-inspection; Protection of records and valuables; Conflagration hazard and protection; Standard plan notations; Publications on fire protection. *Tables*. The tables and how to use them.

**CROSS, CHARLES FREDERICK, and BEVAN, E. J. A Textbook of Paper-making.** By C. F. Cross and E. J. Bevan. Fourth edition, with collaboration of J. F. Briggs. 507 p. 8 vo. 1916. Reprinting

Fourth edition of this standard work, represents considerable revision and embodies the results of the authors' working experience. It is stated that their collaborator, Mr. Briggs, has had the advantage of continuous practical work in one of the leading British paper mills and that "the matter which he has contributed presents a series of illustrations of sound mill practice based upon scientific first principles. Besides describing manufacturing processes there are chapters on testing, analysis, selection of a mill site, paper specialties, and statistics. There is a good annotated bibliography at the end of the volume. The illustrations are noteworthy, especially the photomicrographs.

**CROSS, C. F., BEVAN, E. J., and SINDALL, R. W. Wood Pulp and Its Uses.** With the Collaboration of W. N. Bacon. 281 p. 12 mo. il. \$3.50

*Contents*: The structural elements of wood. Cellulose as a chemical individual and typical colloid. Sources of supply of wood-pulps. Manufacture of mechanical wood pulp. Chemical wood pulp. News and printings. Wood pulp boards. Utilization of wood waste. Testing of wood pulp for moisture. Wood pulps and the textile industries. Specimen pages and various types of paper. Bibliography.

**CROSS, ROY. Handbook of Petroleum, Asphalt and Natural Gas.** 500 p. 8 vo. il. Flexible 1920. \$5.00

*Contents*: Methods of analysis, transportation, storage, tank gauging, pipe lines, chemical and physical properties of various products and hydrocarbons; Production and refining statistics including list of refiners and products, conversion tables, commercial distillation, refining, cracking and engineering; Oil shales; Patents and bibliography. *Geology and economics*.

**CROWELL, B., and MURRAY, C. B. Iron Ores of Lake Superior.** Containing some facts of interest relating to mining and shipping of the ore and location of the principal mines. 264 p. 8 vo. il. 1914. \$3.50

A description in detail of the principal mines and mining districts. *Contents*: Early history. Geology. Mineralogy. Production. Dock equipment. Classification of ores. Beneficiation of ores. Methods of analysis. Fuel engineering. Location and description of mines. Index.

**CUSHMAN, ALLERTON S. Chemistry and Civilization.** 150 p. 8 vo. il. 1920. \$2.50

*Contents*: Chemistry in the past, Chemistry in the service of man; Chemistry and industry; Chemistry and war, Chemistry and the future, Some modern aspects of chemistry.

**DAKIN, H. D., and DUNHAME, E. K. Handbook on Antiseptics.** 129 p. 16 mo. il. 1917. \$1.25

**DANA, G. Automatic Sprinkler Protection.** By Gorham Dana, Manager of Underwriters Bureau of New England. Second edition. 443 p. 8 vo. il. 1919. \$3.50

*Contents*: Introduction. Perforated pipes. Early automatic systems and sprinklers. Later developments in automatic sprinklers. Tests and characteristics of sprinklers. Installation rules. Layout of equipments. Alarm valves. Dry valves. Sprinkler supervisory systems. Maintenance and fire record. Sprinkler leakage. Automatic sprinklers as a protection to life. Combined heat and sprinkler systems. Sypho chemical sprinkler system. Appendix I—List of over 200 sprinklers described and rated. Result of tests on 6,277 old types of sprinklers. Appendix II—Standard report blank for inspection by the assured.

**DANA, J. D. System of Mineralogy of James Dwight Dana, 1837-1868.** Descriptive mineralogy. Sixth edition. By Professor Edward S. Dana, Yale University. Entirely rewritten and much enlarged. With Appendix. Second appendix revised, completing the work to 1909. Third appendix issued separately in 1915. 1323 p. 4 vo. il. 1910. \$15.00

This book is a complete classification of all the mineral species according to a natural arrangement. Although founded in the external characters of the minerals it exhibits in a considerable degree the chemical relations also. In the present edition the scope and usefulness of the work has been much enlarged by the inclusion of the knowledge made available by optical and microscopical studies of the various minerals.

*Contents*: Introduction. Crystallography mineralogy. Nomenclature. Bibliography. General classification. I—Native elements. II—Sulphides, tellurides, selenides, arsenides, antimonides. III—Sulphosalts—sulpharsenides, sulphantimonides, sulphobismuthites. IV—Halides—chlorides, bromides, iodides, fluorides. V—Oxides. VI—Oxy-salts—carbonates, silicates, hydrous silicates, niobates, tantalates, phosphates, arsenates, antimonates, borates, sulphates, chromates, tungstates, molybdates. VII—Salts of organic acids—oxalates, mellates. VIII—Hydro-carbon compounds. Supplement. Catalogue of American localities. Appendices I and II, completing the work to 1909.

**DANA, RICHARD T. Handbook of Construction Equipment, Its Cost and Use.** Author is Consulting Engineer, also Chief Engineer, Construction Service Company. 849 p. 351 il. 12 mo. 1921. Flexible. \$6.00

A complete manual on construction equipment. The descriptions include practically every type of equipment, as well as cost data. It presents data which the engineer often searches through masses of trade catalogs and card index files to find. The arrangement of the material is alphabetical.

The book is offered in lieu of a new edition of the Handbook of Construction Plant.

The prices have been revised as of 1920. Some of the material in the old book is omitted, and about twice as much material as made up

the old book has been added, so that this new book is about three times as large in content as its predecessor.

*Contents*: Main Topic Heads: General principles applying to equipment, Air compressors, Asbestos, Asphalt plants, Automobiles; Backfilling machines; Bar cutters, barges and scows; Bars; Belting for power purposes; Bending machines; Bins, Blacksmith shop outfit; Blasting machines and supplies, Blocks; Blueprint machines; Boilers; Brick rattle; Buckets, Buildings, Caisways, Cars; Carts, Cement gun, Cement testing apparatus, Chains, Chain blocks; Chutes; Concrete placing equipment, Concrete sidewalk and curb forms, Conveyors; Crushers; Derricks driving outfits, Drag scraper, Excavators; Drawing boards, Dredgers, Drills, Electric motors, Elevating graders, Engines; Explosives, Fire equipment, Forges; Fork motors; Furnaces and kettles; Grading machines, Heaters, Hoisting engines, Hoists; Hoses and Mules; Hose, Hydraulic mining guns; Jacks, Lead Levels, Lights; Locomotives and locomotive cranes, Machine shop outfit, Mixers, Motor trucks, Point spraying equipment, Paving, Photography; Picks and mattocks, Pier and foundation equipment, Pile drivers, Piling, Pipe, Pipe line tools; Plant rental charges, Plows, Post hole diggers, Power pumps, Rails and tracks, Rakes, Refrigerating plant, Riveting guns; Road making equipment, Rollers, Rope, Sandblast machines, Sand and gravel washers, Saws, Scales, Scarifiers, Screens, Shovels; Skips; Sledges and hammers, Sprinklers, Stone boats, Stamp pullers, Surveying and Engineering equipment, Tamps, Teats, Ties, Tow boats; Tractors, Trailers, Transits, Trenching machines, Unloading machines; Wagons, Welding, Wheelbarrows, Winches.

**DANBY, ARTHUR. Natural Rock Asphalts and Bitumens.** Their geology, history, properties and industrial application. 254 p. 8 vo. il. 1913. \$2.50

*Contents*: Nomenclature and definitions. Geology of bitumen and rock asphalt. Appearance and physical structure. History and ancient use. Modern exploitation of rock asphalt. Sources of rock asphalt and bitumen. American deposits of bitumen. Extraction and preparation of rock asphalt. Tests and analyses. Physical properties of rock asphalt. The carrying out of rock asphalt work, and of rock asphalt mastic work. Macadam roads. Other uses of bitumen.

**DANCASTER, ERNEST A. Limes and cements; their nature, manufacture and use, an elementary treatise.** 220 p. 12 mo. il. 1920. \$2.75

An up-to-date book of over 200 pages based upon Burnell's *Limes, cements, mortars, etc.* Has a good bibliography, also chapters on water-proofing, efflorescence, stucco, bituminous and oleaginous cements, chemical analysis, and physical and mechanical testing.

**DANIELS, F. E. Operation of Sewage Disposal Plants.** 136 p. 8 vo. il. 1915. \$1.50

Reprinted from articles in the *Municipal Journal*. The main purpose is to assist the plant attendant by pointing out to him many things he should do and some things he should leave undone.

**DARLING, C. R. Heat for Engineers. A Treatise on Heat,** with special regard to its practical application. By Charles R. Darling, Assoc. R.C.Sc., Demonstrator in the Department of Applied Physics and Electrical Engineering, and Lecturer on Heat at the City and Guilds Technical College, Finsbury, London. 430 p. 8 vo. il. 1914. \$5.00

*Contents of Chapters*: I. Heat as a form of energy. Units. II.—Methods of producing heat. The properties, uses, and evaluation of fuels. III.—Specific heat. IV.—Expansion. V.—Practical applications of the property of expansion. VI.—Atmospheric pressure. General properties of gases. VII.—The measurement of temperature. Liquid and gas thermometers. VIII.—The measurement of high temperatures. Pyrometry. IX.—Change of state. Fusion. X.—Practical applications of fusion and allied phenomena. XI.—Vapors. XII.—Evolution. XIII.—Latent heat of vaporization. Properties of steam. XIV.—Atmospheric moisture. Hygrometry. XV.—The production of low temperatures. Liquefaction of gases. XVI.—Refrigerating machinery, ice manufacture and cold storage. XVII.—The transfer of heat. Conduction. XVIII.—The transfer of heat. Convection. XIX.—The transfer of heat. Radiation. XX.—The conversion of heat into work. Laws of thermodynamics. XXI.—The conversion of heat into work. Practical heat engines. Index. Index to tables.

**DARLING, ELTON R. Inorganic Chemical Synonyms and Other Chemical Data.** 109 p. 12 mo. 1919. \$1.00

*Contents*: Introduction. The Elements; Specific Gravity and Temperature Comparison, Standards of Weights and Measures; Chemical Synonyms. Aluminum, Antimony, Arsenic, Barium, Bismuth, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead (Plumbum), Magnesium, Manganese, Mercury, (Hydrargyrum), Nickel, Potassium, Silver, Sodium, Zinc; Miscellaneous Synonyms, Hydrogen Compounds, Cross Index of Chemical Terms.

**DAUGHERTY, R. L. Centrifugal Pumps.** By R. L. Daugherty, A.B., M.E., Professor of Hydraulic Engineering, Rensselaer Polytechnic Institute. A complete but simple treatment of the subject in all its phases. 192 p. 8 vo. il. 1915. \$2.50

*CHAPTER HEADINGS*: I.—Introduction. II.—Description. III.—Installation and operation. IV.—General theory. V.—Theory of centrifugal pumps. VI.—Characteristics. VII.—Disk friction. VIII.—Factors affecting efficiency. IX.—Centrifugal pumps vs displacement pumps. X.—Comparison of types of centrifugal pumps. XI.—General laws and factors. XII.—Pump testing. XIII.—Costs. XIV.—Rotary and screw pumps. XV.—Applications of centrifugal pumps. XVI.—Design of a centrifugal pump. Appendix—A. Test data. B.—Review questions. C.—Table of 34 powers of numbers.

**DAVEY, HENRY. The Principles, Construction, and Application of Pumping Machinery.** (Steam and Water Pressure.) With practical illustrations of engines and pumps applied to mining, town water supply, drainage of lands, etc.; also economy and efficiency trials of pumping machinery. Second edition, revised and enlarged. 336 p. 8 vo. il. \$6.00

*Contents*: Early history of pumping engines. Steam engines (pumping). Pumps and pump valves. General principles of non-rotative pumping engines. The Cornish engine—simple and compound. Types of mining engines. Pit work. Shaft sinking through water bearing strata. Hydraulic transmission of power in mines. Electric transmission of power to pumps. Valve gears of pumping engines. Water pressure pumping engines. Waterworks engines. Pumping engine economy and trials of pumping machinery. Centrifugal and other low-lift pumps. Hydraulic rams, pumping mains, etc. Index.

**DAVIES, JAMES.** Galvanized Iron. Its manufacture and uses. A detailed description of this important industry and its manufacturing processes, by James Davies. 139 p. 8 vo. 1914. \$1.50

**CONTENTS:** Importance of galvanized iron trade; Rates of carriage; Cost of materials; Arrangement of a works; The best markets; Methods of packing; Prices; Brands; Corrugating; Rolling from steel bars; Heat-treatment; Bayline process; Original process; Best process; Weight of coatings; Close annealing; Pickling; Prices of labor; Quality of spelter; Galvanizing baths; Treatment of zinc ashes; Flux skimmings; Treatment of dross; Approximate cost of curved roofs; To estimate the weight of roofs; Prices for fixing; Cost of making gutters and ridging; Approximate cost of machinery for galvanized, corrugated, iron ridging; gutters, tanks and cisterns, buckets, etc.

**DAVIS, PAUL B., and others.** Studies on Solution in its relation to light absorption, conductivity, viscosity, and hydrolysis. 144 p. 8 vo. il. 1908. \$2.00

**DAVY, W. M. and FARNHAM, C. M.** Microscopic Determination of the Ore Minerals. 154 p. 8 vo. \$2.50

**CONTENTS:** Introduction. Previous work. Color and unreliable determinative factor. Lack of consistency in reactions. Advantages of employing few reagents in the tables. Necessity for utilizing all determinative means. Range of material examined. Definition of mineralogical. I. TECHNIQUE OF POLISHING AND EXAMINING THE SPECIMEN. Necessity for specialized polishing methods. Grinding. Polishing. Field preparation of a specimen by hand. Examination of the specimen. Microscope used. Optical principle involved. Construction and use of holder. Method of applying tests. Electrical conductivity. Electropotential of minerals. Concentration of reagents. II. PHOTOMICROGRAPHY OF POLISHED SECTIONS. Equipment. Color filters. Methods of determining proper exposure. Exposure curves. Developing and printing. III. USE OF THE DETERMINATIVE TABLES. Procedure. Abbreviations used. Outline for the tables. Determinative tables. IV. SUPPLEMENTARY TESTS. Tabular arrangement according to: Color of surface, Color of internal reflection, Color of powder, Electrical conductivity, Electro Potential—Tests for the elements with minerals arranged according to elements—Microchemical qualitative reactions. Standard substitutes. Heating on charcoal. Sublimates. Bead colors with borax and salt of phosphorus.

**DAWE, EDWARD A.** Paper and Its Uses. A treatise for printers, stationers and others. 162 p. 8 vo. il. 1914. \$2.25

**DAWIDOWSKY, F.** Glue, Gelatin, Animal Charcoal, Phosphorus, Cements, Pastes, and Mucilages. 282 p. 8 vo. 1920. \$3.00

This volume covers the raw materials and manufacture of skin and bone glue, animal charcoal, phosphorus, and gelatine and the products prepared from it, including and fish glue, methods of testing glue and gelatine, and the preparation and application of cements, pastes and mucilages for use in the workshop, laboratory and office.

**DEERR, N.** Cane Sugar. A textbook on the agriculture of the sugar cane, the manufacture of cane sugar, and the analysis of sugar house products. Together with a chapter on the fermentation of molasses. 608 p. 8 vo. il. Second edition.

**CONTENTS:** The cane; Composition of the cane; Range and climate; Varieties of the cane; Sugar cane soils; Manuring; Irrigation; Insectary pests and diseases; and harvesting of the cane; Extraction of juice by mills; Diffusion process; Clarification and defecation of the juice; Carbonation process; Filtration of the juice; Evaporation of the juice to syrup; Concentration of the syrup to massecuite; Separation of the crystals; Molasses; Megass as fuel; Polaroscope as applied to sugar analysis; Optical assay of sugars; Determination of reducing sugars; Assay of sugar house products; Control of the factory; Fermentation with special reference to the sugar house; Appendix; Tables; Additional notes relating to certain portions of the text.

**DE LA COUX, H.** The Industrial Uses of Water. Translated from the French and revised by Arthur Morris. 362 p. 8 vo. il. 1903. \$5.00

**CONTENTS:** Water, its chemical action and composition; Effects of water in the industries; Difficulties with water; Appropriate remedies; Preliminary treatment and apparatus; Residual waters and their purification; Qualitative, quantitative and hydrometric analysis.

**DE LAVAL, C. G.** Centrifugal Pumping Machinery. By Carl George De Laval, General Manager, Henry R. Worthington. 184 p. 8 vo. il. 1912. \$3.00

A treatise on theory and practice, with definite details on the design of centrifugal and turbine pumps. Mr. De Laval's aim has been to supply accurate and definite information which can be used in design, construction and installation. The material on installations, uses and efficiency is taken from his actual experience.

**DEL MAR, A.** Tube Milling. By Algernon Del Mar, Associate of the Royal School of Mines of London, Member A.I.M.E. 159 p. 8 vo. il. 1917. \$2.00

This book covers the use of the conical and cylindrical tube mills for grinding ore, indicating in detail the best means of obtaining capacity at the least cost. It is the first book devoted entirely to this subject.

**CONTENTS:** Introduction. I—General description. II—Amalgamating with the tube mill. III—Grinding ores with the tube mill for flotation. IV—Crushing efficiencies. V—The use of wrought iron and alloy steel. Appendix.

**DENNIS, L. M.** Gas Analysis. By L. M. Dennis, Head of the Department of Chemistry in Cornell University. 434 p. 8 vo. 1913. \$2.75

The author, who translated Hempel's "Methods of Gas Analysis," has now prepared a book of his own which embodies the results of the most recent research and the newest methods. Detailed consideration is given to the collection and storage of gases, the measurement of large gas volumes, the purification of mercury, the determination of individual gases, the fractional combustion of certain gases, the analysis of flue gas, illuminating gas and fuel gas, the determination of the heating value of solid, liquid and gaseous fuels, the complete analysis of commercial acetylene, the determination of water vapor and carbon dioxide in the atmosphere, the analysis of saltpeter with the nitrometer,

and the applications of the Lunge nitrometer to gas volumetric work. The book also contains descriptions of several new forms of apparatus or new methods, among which may be mentioned a portable Hempel apparatus, a new form of Orsat apparatus, a modified nitrometer, a method for the determination of phosphine in commercial acetylene, and an improved form of apparatus for the fractional combustion of hydrogen by means of copper oxide.

**DENNIS, L. M., and WHITTELEY, T.** Qualitative Analysis. Revised edition. By L. M. Dennis, Head of the Department of Chemistry and Professor of Inorganic Chemistry in Cornell University, and Theodore Whittlesey, Director of the General Laboratories, United States Rubber Company, New York City. 145 p. 8 vo. 1912. \$1.00

This manual is both exact and compendious, avoiding the diffuseness of the larger treatises and the incompleteness of the elementary books.

**DERR, L.** Photography for Students of Physics and Chemistry. By Louis Derr, M.A., S.B., Professor of Physics in the Massachusetts Institute of Technology. 247 p. 12 mo. 1916. \$2.25

**DESCH, CECIL H.** Chemistry and Testing of Cement. 267 p. 8 vo. 1911. \$4.00

**CONTENTS:** History of calcareous cement; Raw materials and process of manufacture; Chemical compounds; Constitution of cement; Setting and hardening; Mechanical properties; Resistance to destructive agents; Chemical analysis; Conclusion; Indexes.

**DESCH, CECIL H.** Intermetallic Compounds. 116 p. 8 vo. 1914. \$1.60

**CONTENTS:** Introduction. Thermal analysis; Microscopic structure; Isolation of intermetallic compounds; Native intermetallic compounds; Physical properties; Existing in the liquid state; Relations to carbides, silicides, etc.; Chemical nature; Ternary compounds; Index.

**DICTIONARY, CHEMICAL, CONDENSED.** (See Condensed Chemical Dictionary).

**DIETERICH, ERNEST E. F.** A Practical Treatise on Friction, Lubrication, Fats and Oils. Second edition, thoroughly revised and enlarged. 153 p. 12 mo. 1916. \$1.50

**CONTENTS:** I—Friction. II—Lubrication. III—Oils and fats. IV—Oils and fats of mineral and vegetable origins, their preparation, and how they are obtained. V—Clarifying, refining and bleaching oils and fats. VI—Mineral oils. VII—Petroleum oils. VIII—Manufacture of lubricating oils. IX—"Valve oil" oils. X—Leather oils. XI—Adulterations of fatty oils. XII—Testing oils. XIII—Solid lubricants. XIV—Some practical suggestions. XV—Lubricators and cups. XVI—Specific gravity. XVII—Review of the petroleum oil industry to 1915. Index.

**DIETERICH, K.** Analysis of Resins, Balsams, and Gum Resins. With a bibliography. Translated from the German. Second edition. Revised and enlarged by H. B. Stocks. 347 p. 8 vo. 1920. \$7.00

**CONTENTS:** General Discussion and Exposition; Origin; Habitat; General Properties; Commercial Varieties; Adulterants; Analysis and Bibliography of All Balsams, Resins and Gum Resins.

**DOLT, MAURICE L., Ph.D.** Chemical French, An Introduction to the Study of French Chemical Literature. 308 p. Cloth. 8 vo. 1920. \$4.00

This book is intended for students of chemistry wishing to acquire a reading knowledge of French in that particular science. For those who have had one or two years of French, the reading of scientific French will still offer certain difficulties which an ordinary dictionary will not solve, and for those who have not had any French, the task will be enough to discourage them. The book can be used by a beginner or a class of beginners. The selections were made carefully, with two things in mind: first, to give practice in reading original articles in the different branches of chemistry; second, to give an opportunity to American student to get acquainted with the pioneering work of the French chemists. These selections include articles published in the French journals of chemistry by some of the best known French chemists.

**DONKIN, BRYAN.** A Textbook on Gas, Oil, and Air Engines. Fifth edition, revised and enlarged, with revision by Prof. Burstall and T. Graves Smith, M.I.Mech.E. 639 p. 8 vo. il. 1905. \$9.00

**CONTENTS:** Part I—Gas engines.—General description of the action and parts of a gas engine. Heat "cycles" and classification of gas engines. History of the gas engine. The Atkinson, Griffin, and Stockport engines. The Otto gas engine. Modern British gas engines. Modern French gas engine. German gas engines. Gas production for motive power. Utilization of blast-furnace and coke-oven gases for power. The theory of the gas engine. The chemical composition of gas in an engine cylinder. The utilization of heat in a gas engine. Explosion and combustion in a gas engine.

Part II.—Petroleum Engines.—The discovery, utilization, and properties of oil. Methods of treating oil. Carburettors. Early oil engines. Working methods in oil engines. The Priestman oil engine. Other British oil engines. American gas and oil engines. French and Swiss oil engines. German oil engines. Practical application of gas and oil engines.

Part III.—Air engines.—Theory of air engines. Difficulties. Trials. Appendices. Bibliography. Index.

**DONKIN, BRYAN.** The Heat Efficiency of Steam Boilers: Land, Marine and Locomotive, with tests and experiments on different types, heating value of fuels, analyses of gases, evaporation, and suggestions for testing boilers. 311 p. 8 vo. il. 1905. \$7.00

**CONTENTS:** Classification of different types of boilers. Explanation of the headings of the tables. Tables of experiments on boilers. Fire grates of various types. Mechanical stokers. Combustion of fuel in boilers. Transmission of heat through boiler plates and their temperature. Feed water heaters, superheaters, feed pumps, etc. Smoke and its prevention. Instruments used in testing boilers. Marine and locomotive boilers. Fuel testing stations. Discussion of the trials and conclusions. On the choice of a boiler, and testing of land, marine, and locomotive boilers. Appendices. Bibliography. Plates of steam boilers. Index.



**DORLAND, W. A. N. (Editor).** *American Pocket Medical Dictionary.* Tenth edition. 67 p. 16 mo. 1917. \$1.50

**DOTY, ALVAH H., M.D.** *A Manual of Instruction in the Principles of Prompt Aid to the Injured.* 229 p. 12 mo. 1914. \$2.00

**DOWD, MARY T., and JAMESON, J. D.** *Food; Its Composition and Preparation.* A textbook for classes in household science. By Mary T. Dowd and Jean D. Jameson, Teachers of Household Science, Washington Irving High School, New York City. 173 p. 12 mo. il. 1918. \$1.50

Gives a clearer conception of the relation between the cost of foods and their nutritive value. An elaboration of the notes dictated by the authors to their own High School classes.

**DRAPER, CHARLES H.** *Heat and the Principles of Thermodynamics.* New and revised edition. 444 p. 8 vo. il. 1914. \$2.25

The subject matter in this new edition has been revised and rewritten in order that the book may be in accord with the recent advances made in the methods of heat measurement and the theories brought to light by recent investigations.

**CONTENTS:** Units of measurement. Symbols. Formula. Experimental. Temperature. The thermometer. Expansion of solids, liquids, and gases. Remarks on expansion. Specific heat. Calorimetry. Liquefaction and solidification. Latent heat. Properties of vapors. Effluvia. Latent heat. Liquefaction of gases. Hygrometry. Heat and electricity. Conductivity. Thermochemistry. Radiation. Measurement of temperature. Principles of thermodynamics. Work and energy. Mechanical equivalent of heat. The kinetic theory. Internal and external work. Isothermal Curves. Continuity of state. Specific heats of gases. Adiabatic changes and curves. Heat engines. Theory of heat engines. Some applications of Carnot's principles. Miscellaneous examples and exercises. Appendix. Answers to exercises.

**DUBOSC, A., and LUTTRINGER, A.** *Rubber, its production chemistry and synthesis in the light of recent research. A practical handbook for the use of rubber cultivators, chemists, economists and others.* English edition by Edward W. Lewis. 383 p. 8 vo. 1918. \$6.50

Brings together, with comments, scattered accounts from various journals, "some of which are not easy to procure." Section 1 deals with natural rubber, its statistics and costs, with chapters on resins and reclaimed rubbers, section 2 with the formation, physical and chemical properties, analysis and constitution of crude rubber, section 3 (150 pages) with synthetic rubber. Many footnote references. A valuable list of patents on reclaimed rubber on pages 41-45.

**DUERR, GEORGE and TURNBULL, WILLIAM.** *Bleaching and Calico-Printing.* 158 p. 8 vo. 1896. (Dyed and printed patterns.) \$4.50

This book is intended as a reliable and practicable guide to the young bleacher and calico printer. The subject is necessarily treated technically, yet the aim throughout has been to make it as clear, concise, and simple as is consistent with a thorough scientific explanation of the principles involved. Chemical equations are freely used for the purpose of illustrating methods of preparing the various mordants, dyestuffs, and other substances necessary for the production of the colors.

**CONTENTS:** Bleaching. Printing. Mordants. Styles of calico-printing. Thickeners. Natural organic coloring matters. Tannin matters. Oils, soaps, solvents. Organic acids, salts. Mineral colors and pigments. Coal-tar colors. Dyeing. Water. Theory of colors. Index. Patterns.

**DUMESNY, P., and NOYER, J.** *Wood Products, Distillates and Extracts.* The chemical products of wood distillation, dyeing and tanning extracts from wood. 336 p. 4 to 1913. \$5.00

**CONTENTS:** The distillation of wood. Generalities. Principal methods of carbonizing or "coaling" wood; The acetic acid industry; Secondary products of wood distillation. Analysis of raw materials and finished products; Destructive distillation of olive oil residuals, Methyl alcohol; Table of density. The manufacture and testing of tan wood extracts and their utilization in modern tanneries. Chestnut wood extract. Plant and equipment for treating chestnut wood, specification of model type of an extract factory; Capital required, etc.; Number and capacity of extract factories; Method of using chestnut wood extracts in tanning; Manufacture and use of oak wood extracts; Manufacture and use of quebracho and sumac extracts; Khaki substitute for quebracho and use of quebracho; Extract from various tanning substances; Their manufacture and use; Divi-divi; Valonia; Chinese galls; Myrobolam; Palmetto; Mimosa, Tara, Mangrove, etc.; Manufacture and use of logwood extract. Analysis of tanning substances. The official method of the International Association of Leather Chemistry; Appendix.

**DUNBAR, W. P.** *Principles of Sewage Treatment.* Translated with the author's sanction by H. T. Calvert, M.Sc., Ph.D., F.I.C. 271 p. 8 vo. il. 1908. \$5.00

**CONTENTS:** Part I.—Historical development of the sewage problem. Growth of river pollution. Legal measures taken by central and local authorities. Rise and development of methods of sewage treatment. Earlier views on methods of sewage treatment—their object and utility.

Part II.—The present position of sewage treatment. The characteristics of sewage. Objects of purification works. Description of methods for the removal of suspended matters. Methods for the removal of putrescibility. The disinfection of sewage. Supervision and inspection of sewage disposal works. The utility and cost of the various methods of sewage treatment.

**DUNCAN, J., and STARLING, S. G.** *Textbook of Physics for Students of Science and Engineering.* 3 pts. in 1 vol. 1081 p. 8 vo. il. 1918. \$5.50

Prepared to meet a demand for a text-book of physics which will connect more intimately the scientific aspects of physics with its modern practical applications.

**CONTENTS:** Dynamics. Heat. Light. Sound. Electricity and magnetism.

**DUNN, F. B.** *Industrial Uses of Fuel Oil.* 235 p. 8 vo. il. 1916. \$3.00

Concise and practical, this work should be of service to engineers, architects, efficiency engineers, or others interested in the subject. Besides the chapters on the applicability of fuel oil to the glass, rubber, sugar, steel, and other industries, there is one devoted to domestic use. The chapter on furnace efficiency describing how boiler losses may be checked and efficiency determined is noteworthy. Fully illustrated with many line drawings.

**DUNSTAN, A. E., and THOLE, F. B.** *Viscosity of Liquids.* (Monographs on inorganic and physical chemistry.) 91 p. 8 vo. il. 1914. \$1.60

**CONTENTS:** Development of a working formula. Measurement of viscosity. Viscosity of liquid mixtures. Viscosity of electrolytic solutions. Viscosity of colloids. Relation between viscosity and chemical constitution. Some applications. References. Index.

**DYKE, A. L.** *Automobile and Gasoline Engine Encyclopedia.* Twelfth edition. 948 p. 46 il. 1920. \$6.00

It is not what one might term an encyclopedia in the true sense of the word, yet it is one of the most complete reference books on automobiles yet published, any subject, trouble, remedy, or repair one might think of can be found in the 6,000 lines of index.

**DYSON, S. S.** *A Manual of Chemical Plant.* 8 vo. il. In thirteen parts. (Not sold separately.) Paper. 1921. In preparation.

A record of the practical outcome of research and experiment as embodied in the range of plant which is actually available for the carrying out of the operations and processes of industrial chemistry. The work therefore places in the hands of the chemical engineer, the chemical manufacturer, the chemical works manager, and the student of chemical technology the results of a long and patient examination of the claims of almost every new piece of chemical plant that has been introduced during the last twenty-five years, together with an exhaustive analysis of the patent literature of the same.

**DYSON, S. S., and CLARKSON, S. S.** *Chemical Works, Their Design, Erection, and Equipment.* 220 p. 8 vo. il. 1912. \$9.00

**CONTENTS:** Choice of site. Notes of materials used in construction. First principles in laying out a work. Arrangement of buildings; Stores. Workshops. The drainage system. Foundations. Retaining walls. Fire prevention. Ambulance arrangements. The power house; Boilers. Coal store. Automatic weighing machines; Chimney. Pumps. Steam engines. Steam turbines. Sulphuric acid plant; General design. Chambers. Glover tower. Gay Lussac tower. Notes on vitriol manufacture. Recent developments in vitriol plant design and working. Hydrochloric acid plant. Nitric acid plant. Notes on high explosives plant. Sulphate of ammonia plant. Notes on fertilizer plant. General plant. Appendix. On the chemical engineer. The saw mill and box-making department. On the alkali, etc., works regulation act. (a) Alkali works and alkali waste. (b) Sulphuric acid, muriatic acid and other specified works. (c) Regulation of works; Inspection; Special rules. Procedure. "Welfare work" or "Prosperity sharing."

**EAKLE, ARTHUR S.** *Mineral Tables for the Determination of Minerals by Their Physical Properties.* 73 p. 8 vo. 1904. \$1.50

The tables include the common minerals and a few others of local prominence, usually considered as rare in occurrence. The minerals are arranged primarily according to streak and color, and under each color according to hardness.

**ECKEL, EDWIN C.** *Building Stones and Clays. Their Origin, Characters, and Examination.* 264 p. 37 il. 8 vo. 1912. \$3.00

**CONTENTS:** Part I—Building Stones. The origin and structure of rocks; Igneous rocks in general. Granites, Trap rock, Serpentine and soapstone. Sedimentary rocks. Slates, Sandstones, Limestones, Marbles; Field examinations and valuations. Laboratory testing of stone. Part II—Clays. General classification. Residual clays. Transported clays; Distribution of Clays. Field examination of clay deposits.

**ECKEL, EDWIN C.** *Iron Ores. Their Occurrence, Valuation and Control.* By Edwin C. Eckel, Associate, Am. Soc. C. E.; Fellow, Geol. Soc. of America. 427 p. 8 vo. 1914. \$4.00

A discussion of iron ore not only in their geologic and technical relations but in their more general relations to industrial conditions. Emphasis is laid on the origin of the deposits, the valuation of iron ore properties, mining conditions and costs, the world's deposits of ore, and the extent and control of reserves.

**CONTENTS:** Introductory. Chapter I.—The industrial status of iron. Part I.—The origin of iron ore deposits. II.—The geologic and chemical relations of iron. III.—The iron minerals and their relationships. IV.—The formation of iron ore deposits. V.—Sedimentary or bedded deposits. VI.—Replacements and cavity fillings. VII.—Alteration deposits. VIII.—Igneous iron deposits. Part II.—The valuation of iron ore deposits. IX.—Basal factors in ore valuation. X.—Prospecting and tonnage determinations. XI.—Mining conditions and costs. XII.—Furnace and mill requirements. XIII.—Composition and concentration of iron ores. XIV.—Ore prices, profits and markets. XV.—The effect of time on valuation. Part III.—The iron ore of the world. XVI.—Iron ore of the United States, General; XVII.—The Lake Superior district. XVIII.—The southern United States. XIX.—The northeastern United States. XX.—The western United States. XXI.—Newfoundland and Canada. XXII.—West India, Mexico and Central America. XXIII.—South America. XXIV.—Europe. XXV.—Asia, Africa and Australia. Part IV.—Extent and control of iron ore reserves. XXVI.—The extent of American ore reserves. XXVII.—Probable duration of American reserves. XXVIII.—Ownership and control of American reserves. XXIX.—Iron ore reserves of the world. XXX.—World competition in iron and steel. XXXI.—Questions of public policy. XXXII.—Questions of private policy.

**EDELMAN, PHILIP E.** *Inventions and Patents.* 300 p. 12 mo. 1915. \$2.00

A broad general exposition, in simple terms, of the procedure in the patent office and of the possibilities in patented inventions. Contains much information valuable to inventors, investors and manufacturers.

**CONTENTS:** Development of the Patent Office system. The Patent Office. Patent attorneys. The germs of invention. The field of invention. Preliminary steps to secure a patent. Patentability and practicality. Application for and prosecution of a patent. Protecting an

invention. Points of patent procedure. Patent rights and how they are utilized. Disposing of patent rights. About infringements. Points about foreign patents. Thoughts on inventions and inventors. The present status of inventions. Memoranda. Appendix.

**EDWARDS, C. A.** *The Physico-Chemical Properties of Steel.* 229 p. 8 vo. il. 1916. \$6.00

A comprehensive account of the chemical and structural constitution of steel, describing the internal changes that occur when steels are heated and cooled under varying conditions and indicating the effect of those conditions upon the properties of the material. Places the study of steel upon a sound scientific basis. All the important phases dealing with the metallography of steel are thus put in a condensed form.

**CONTENTS:** Constitution of metallic systems. Structure of metals. Iron. Constitution of the iron-carbon system. Micro-structure of iron-carbon steels. Solidification of steel ingots. Iron-carbon steels phosphorus. Sulphur. Burning and overheating of steel. Deformation and strain hardening of metals. The properties of cold drawn wire and the effect of acid cleaning. Cementation and case hardening. Theories of hardening by quenching. Special steels. Tungsten carbon steel. High speed tool steel. Manganese chromium, aluminum, silicon, and vanadium steels. Structural constitution of special Ternary steels. Index to authors cited. Index to subjects.

**EFFRONT, J.** *Biochemical Catalysts in Life and Industry. Proteolytic Enzymes.* By Jean Effront, Professor in the New University and Director of the Institute of Fermentations of Brussels. Translated by Samuel C. Prescott, Professor of Industrial Microbiology, Massachusetts Institute of Technology. Assisted by Charles S. Venable. 752 p. 8 vo. 1917. \$6.00

In this volume the author has occupied himself exclusively with the catalysts for nitrogenous substances. The chemist will find in this book data on all the proteolytic enzymes. The book also describes the different enzymes known as anti-venom, antipain, etc., and shows how the formation of all these substances results from the same principle, that of vital defense.

**SUMMARY OF CONTENTS:** Introduction. Part I.—COAGULATING ENZYMES. Thrombin. Myosinase. Rennet. Part II. *PEPSIN*. History. Distribution, preparation and chemistry. Reversible action of enzymes. *PLASTINS*. Part III.—*TRYPSIN*. Pancreatic trypsin. Functioning of digestive gland. Trypsins of various origins. Antigens, antibodies. Complement. Part IV.—*INTRASTINAL FERMENTATION*. Peptolytic enzymes. Enzymes of the nuclei. *PROTEINASE*. Arginase. Creatine creatase, creatase, creatinase. Part V.—*AMIDASES*. Part VI.—*APPLICATIONS*.

**EFFRONT, J.** *Enzymes and Their Application.* By Dr. Jean Effront. English translation by Professor Samuel C. Prescott. 322 p. 8 vo. \$3.00

**CONTENTS:** General properties. Manner of action of diastases. Individuality of enzymes. Sucrase. Fermentation of molasses. Amylase. Industrial applications of amylase. Maltose. Lavour fermentation. Role of amylase in the distillery. Quantitative study of malt. Maltase. Industrial applications of maltase. Enzymes of carbohydrates. Ferments of glycerides and glucosides. Zymase. Oxidases.

**ESSLER, MANUAL.** *High Explosives.* Nitroglycerin and Dynamite: Their manufacture, use, and application to mining and military engineering. Pyroxylin, or gun-cotton, fulminates, picrates and chlorates. Third edition. 406 p. 8 vo. 1914. \$4.00

**CONTENTS:** Chemistry and analysis of various bodies which enter into the manufacture of the high explosives: Nitroglycerine; Its manufacture, chemical and physical properties; The various high explosives prepared with nitroglycerine, and their properties; Other varieties of high explosives: Pyroxyline, gun-cotton, nitro-cellulose; Fulminating compounds; Analysis of nitro-glycerine compounds; Directions for using the high explosives; Electricity as applied to blasting operations; Principles of blasting force and effect of explosive bodies; Mining and engineering problems; Large mines; Destruction of walls, obstructions to navigation, iron plates, and cannons; The application of high explosives in agriculture; blasting of trees, grubbing of stumps, blasting of piles; Submarine mines. The application of the high explosives for military purposes. Appendix: Questions relating to the preservation of nitro-glycerine compounds. Proofs of stability. Dynamite with nitrate of ammonium base; Nitro-gelatin; Gun-cotton; The qualities of explosive bodies; Explosions by influence; The origin of the nitrates.

**EKELEY, JOHN B.** *A Laboratory Manual of Inorganic Chemistry.* 128 p. 8 vo. 46 il. 1912. \$1.25

Comprises a series of experiments covering the subject matter of Professor Holleman's "Text Book of Inorganic Chemistry." Arranged for the use of beginners in and teachers of chemistry.

**ELDRIDGE, A. A., and BRISCOE, H. V. A.** *First Aid in the Laboratory and Workshop.* By Arthur A. Eldridge, B.Sc., and H. V. A. Briscoe, B.Sc., Demonstrators in Chemistry, Imperial College of Science and Technology. With a foreword by Surg. General Sir Alfred Keough, K.C.B. 32 p. 8 vo. 1915. \$0.45

**ELIOT, C. W., and STORER, F. H.** *Compendious Manual of Qualitative Chemical Analysis.* As revised by W. R. Nichols. Newly revised by W. R. Lindsay and F. H. Storer. Twenty-second edition. 209 p. 12 mo. 1920. \$1.50

**CONTENTS:** Definition and Scope of Qualitative Analysis; Examples of the Separation; Chlorides Insoluble in Water and Acids; Sulphides Insoluble in Water; Acids and Alkalies; General and Special Tests for Non-Metallic Elements; Treatment of Substances of Unknown Composition; Reagents; Solutions of Known Composition; Utensils.

**ELLIS, CARLETON.** *The Hydrogenation of Oils, Catalysts and Catalysis, and the Generation of Hydrogen.* New enlarged edition. 700 p. 8 vo. il. 1919. \$7.50

**CONTENTS:** Methods of hydrogenation; Catalysts and their rôle in hydrogenation processes; The base metals as catalysts; Nickel carbonyl; The rare metals as catalysts; The occlusion of hydrogen and the mechanism of hydrogen addition; The analytical constants of hydrogenated oils; Edible hydrogenated oils; Uses of hydrogenated oils and their utilization in soap making; Hydrogenation practice; The hydrogen problem in oil hardening; Water gas as a source of hydrogen and the replacement of carbon monoxide by hydrogen; Liquefaction and other methods for the removal of carbon dioxide; Hydrogen by the decomposition of hydrocarbons; Hydrogen by the action of steam on

heated metals; Action of acids on metals; Miscellaneous methods of hydrogen generation; Hydrogen by the electrolysis of water; safety devices. Appendix.

Heretofore the literature on hydrogenation has been scattered through many periodicals, and, except for a few condensed briefs, has not found its way into book form. In this work the author has collected and arranged in logical order all the known facts and figures of this important new branch of chemistry. The treatise describes the numerous processes proposed for the treatment of various oils with hydrogen, and gives many details of operation on the large scale. The catalytic materials employed and the manner of preparation are discussed fully, and all useful methods of generating hydrogen gas are detailed. The publication is one which should be of great interest to workers in fatty and petroleum oils, and in fact in all arts where the treatment of unsaturated organic compounds is involved.

**ELLIS, CARLETON, and MEIGS, JOSEPH V.** *Gasoline and Other Motor Fuels.* 728 p. 8 vo. 206 il. 2 folding plates. 1921. \$10.00

A complete survey of the field, giving a description of practically every process of making gasoline and most other motor fuels of promise or prominence.

**CONTENTS:** Introduction; Mixed fuels; Gasoline refinery; Practice; Refining methods; Sulphur removal; Chemical treatment; Distillation; Forwood's processes; Distillation under pressure; Cracking in stills under pressure; The Burton process, Coast's processes; Cracking heavy oils in the liquid state or phase; Tube and retort cracking in the vapor phase; Hall's processes and methods. The Rittmann process; Processes using steam; Cracking in the presence of hydrogen, hydrocarbon and other gases; Chemical methods of cracking oils; Cracking and distilling by means of fused baths and indirect heating means. The testing of motor fuels; Cracking with the aid of internal heat; cracking by electrical methods; The condensation of hydrocarbons from gases; Benzol use as motor fuel and manufacture; Alcohol as motor fuel; Shale as a source of motor fuel; The pyrolytic treatment of asphalt; Appendix; Statistics on petroleum products. The coke industry in 1919.

**ELMS, J. W.** *Water Purification.* By Joseph W. Elms. Mem. Am. Soc. C.E.; Am. Chem. Soc.; Am. Public Health Assn., and New England W. W. Assn. 485 p. 8 vo. 1917. \$6.00

A comprehensive treatment of the whole subject of water purification, by a man who is widely known for his work in this field, and who has been closely identified with the development of the science through many years.

The design, construction, equipment and operation of filtration plants are fully covered. Costs, both of construction and operation, are given.

**EMERY, FREDERIC B.** *Elementary Chemistry.* 666 p. 12 mo. il. 1909. \$1.50

**CONTENTS:** General description; Introductory; Description of non-metallic elements and their compounds; Description of metallic elements and their compounds; Organic compounds; Mathematical; Experimental.

**EMMONS, WILLIAM HARVEY.** *Geology of Petroleum.* 624 p. 8 vo. 254 maps and illustrations. 1921. \$6.00

This book presents a perspective of the geology of petroleum. It is intended as a textbook for students and also as a manual for the practising geologist who is undertaking the study of a field new to him. It is a concise discussion of the origin, occurrence, accumulation, and distribution of oil and gas. It includes the salient facts relating to the geology of the world's principal oil fields, with references to literature that describes them in detail.

**CONTENTS:** 1. Geographic and geologic distribution of petroleum; 2. Surface indications of petroleum and gas; 3. Openings in rocks; 4. Association of petroleum and salt water; 5. Reservoir rocks and covering strata; 6. Properties of petroleum; 7. Origin of petroleum and gas; 8. Map making and log interpretation; 9. Accumulation of petroleum; 10. Structural features of oil and gas reservoirs; 11. Deformation of petroliferous strata; 12. Metamorphism of petroleum by dynamic agencies; 13. Gas pressure, oil recovery, and behavior of oil wells; 14. Petroliferous provinces and petroleogenic epochs; 15. Appalachian, Lima-Indiana, and Michigan fields; 16. Illinois fields; 17. Mid-Continent fields; 18. Prospects in Mississippi, Alabama, and Georgia; 19. Coast fields of Texas and Louisiana; 20. Rocky Mountain fields; 21. Pacific Coast fields of California and Alaska; 22. Canada and Newfoundland; 23. Mexico; 24. Europe, except Russia; 25. Russia, Mesopotamia, Persia, and Egypt; 26. Burma and Oceania; 27. Caribbean Islands; 28. South America.

**EMMONS, W. H.** *The Principles of Economic Geology.* By William Harvey Emons, Ph.D., Professor and Head of Department of Geology and Mineralogy, University of Minnesota; Director Minnesota Geological Survey; formerly Geologist, Section of Metalliferous Deposits, United States Geological Survey. 612 p. 8 vo. il. 1918. \$5.00

A presentation of the science of metalliferous and non-metalliferous deposits for advanced students of geology. The first part of the book is a general treatment of mineral deposits. The second part is a treatment of each of the metals and of the more valuable non-metallic minerals. Numerous mining districts and their deposits, chosen as far as practicable from North America, are described. Mineral fuels are not included.

**CONTENTS:** Chapter I.—Introduction. II.—Classification of ore deposits. III.—Deposits formed by magnetic segregation. IV.—Pegmatite deposits. V.—Contact metamorphic deposits. VI.—Deposits of the deep vein zone. VII.—Deposits formed at moderate depths by hot solutions. VIII.—Deposits formed at shallow depths by hot solutions. IX.—Deposits formed at moderate and shallow depths by cold meteoric solutions. X.—Sedimentary deposits. XI.—Primary ore shoots. XII.—Deformation of ore deposits. XIII.—Faulting and folding of ore deposits. XIV.—Dynamic metamorphism of ore deposits. XV.—Superficial alteration and enrichment of ore deposits. XVI.—Openings in rocks. XVII.—Structural features of openings in rocks and of epigenetic deposits. XVIII.—Metasomatic processes. XIX.—Mineral associations in veins and wall rock alterations. XX.—Metallogenic provinces and metallogenic epochs. XXI.—Composition and source of ascending thermal metalliferous water. XXII.—Iron. XXIII.—Copper. XXIV.—Gold. XXV.—Silver. XXVI.—Zinc and lead. XXVII.—Miscellaneous metalliferous deposits. XXVIII.—Deposits of the non-metals.

**ENGELHARDT, V.** *The Electrolysis of Water.* By Viktor Engelhardt, Chief Engineer and Chemist of the Siemens & Halske Co., Limited, Vienna. Authorized English Translation by Joseph W. Richards, M.A., A.C., Ph. D., President of

the American Electro-Chemical Society, Professor of Metallurgy at Lehigh University. 140 p. 8 vo. il. \$1.50

CONTENTS: I.—Historical review. II.—The constants of the electrolytic decomposition of water. III.—Review of the processes. IV.—Applications. V.—Appendix.

ENNIS, WILLIAM D. Applied Thermodynamics for Engineers. Fourth edition, corrected. 514 p. 8 vo. il. 1915. \$5.00

CONTENTS: The nature and effects of heat. The heat unit. Specific heat. First law of thermodynamics. Laws of gases. Absolute temperature. The perfect gas. Thermal capacities. Specific heats of gases. Joule's law. Graphical representations. The Carnot cycle. The second law of thermodynamics. Entropy. Compressed air. Hot air engines. Gas power. Theory of vapors. The steam engine. Modified cycle. Multiple expansion. Engine testing. The steam turbine. Results of trials of engines and turbines. The steam power plant. Distillation. Fusion. Liquefaction of gases. Mechanical refrigeration. The subject is treated as related to its engineering applications. Differential equations have been almost wholly eliminated, the mathematical complications have been as far as possible avoided, and the rule has been kept in mind to employ the calculus only in the few places where it really makes things simpler.

ENNIS, WILLIAM D. Linseed Oil and Other Seed Oils. An industrial manual. 330 p. 8 vo. il. \$5.00

CONTENTS: Introductory. The handling of seed and the disposition of its impurities. Grinding. Tempering the ground seed and moulding the press cake. Pressing and trimming the cakes. Hydraulic operative equipment. The treatment of the oil from the press to the consumer. Preparation of the cake for the market. Oil yield and output. Shrinkage in production. Cost of production. Operation and equipment of typical mills. Other methods of manufacturing. The seed crop. Technical trade. Chemical characteristics of linseed oil. Boiled oil. Refined and special oils. The linseed oil market. The feeding of oil cake. Miscellaneous seed oils. The cottonseed industry. Glossary.

ERMEN, W. F. A. The Materials Used in Sizing. Their chemical and physical properties, and simple methods for their technical analysis and valuation. 130 p. 12 mo. \$2.00

CONTENTS: The starches and other agglutinants; Weighting materials; Softening ingredients; Antiseptics; Analysis of sized wraps and cloth; The preparation of normal volumetric solutions. Tables.

EVANS, E. A. Lubricating and Allied Oils. 128 p. il. 8 vo. 1921. \$4.00

CONTENTS: History of petroleum; Oil refining; Occurrence of fatty oils; Physical tests; Chemical tests; Oxidation of petroleum; Oleography; Selection of lubricants; Oils employed, Appendix, Index.

EWING, J. A. Mechanical Production of Cold. 204 p. 8 vo. Second edition. 1921. \$8.00

CONTENTS: General Principles of refrigeration; Air machines; Absorption machines; The Vapor compression process; Trials of refrigerating machines; Uses of mechanical refrigeration; Application of extreme cold; Appendices.

FAIRIE, J. Notes on Pottery Clays. The distribution, properties, uses and analysis of ball clays, china clays and china stone. With tables and formulas. 135 p. 12 mo. 1901. \$2.00

CONTENTS: Properties of clays; Brick, Fire, Pottery; Pipe, Dorsetshire and Devonshire; Koochin or china; Cornish china, Analysis of clays. Preparation of clays; Sources of Irish porcelain clays; China stone, its discovery, use, composition, occurrence and analysis.

FALK, K. GEORGE. Chemical Reactions: Their Theory and Mechanism. 220 p. 8 vo. 1920. \$2.50

CONTENTS: Introduction; Valence; Co-ordination number; Acids and bases; Catalysis; Chemical reactions, general considerations; Some chemical reactions; Olefins and their reaction products; Oxidation-reduction; Some oxidation-reduction reactions.

FALK, K. GEORGE. The Chemistry of Enzyme Actions. 136 p. 8 vo. American Chemical Society Monograph. 1921. \$2.50

CONTENTS: Introduction; Velocities of Chemical Reactions; General Theory of Chemical Reactions; Catalysis; Chemical Reactions Catalyzed by Enzymes; Physical Properties Common to Enzyme Preparations; Chemical Properties Common to Enzyme Preparations; Chemical Nature of Certain Enzymes; Mechanism of Enzyme Actions, Uses and Applications of Enzymes; Present Status of Enzyme Problem.

FARMER, F. M. Electrical Measurements in Practice. By F. Malcolm Farmer, Chief Engineer, Electrical Testing Laboratories (New York); Fellow A. I. E. E.; Mem. A. S. M. E., etc. 360 p. 8 vo. il. 1917. \$4.50

A presentation from the standpoint of engineers who are actively engaged in making measurements, tests and investigations in the electrical industry. The author has aimed to develop a simple, practical discussion, avoiding the highly theoretical point of view. Instruments form a prominent part of the discussion, but detailed descriptive matter pertaining to commercial instruments has been limited to those in most general use.

CONTENTS: I.—Introduction. II.—Galvanometers. III.—Continuous E.m.f. measurements. IV.—Continuous current measurements. V.—Alternating E.m.f. measurements. VI.—Alternating current measurements. VII.—Resistance, reactance and impedance measurements. VIII.—Power measurements. IX.—Energy measurements. X.—Maximum demand instruments. XI.—Inductance measurements. XII.—Capacitance measurements. XIII.—Frequency and slip measurements. XIV.—Wave-form determinations. XV.—Magnetic measurements. XVI.—Curve-drawing instruments.

FARRELL, FRANK J. Dyeing and Cleaning: A practical handbook. Third edition, 253 p. 12 mo. il. \$2.00

This book justifies the subtitle, more attention being paid to the general principles which govern the methods employed than to minute working details. The latter are superfluous to the practical man, and of little value to the beginner.

CONTENTS: Technology of the textile fibres. Dry cleaning. Wet cleaning. Dyeing. Dry cleaning. Special methods—cleaning and dyeing skin, furs, leathers, and hats. Finishing. Reprint from *Lancet* on adulteration of fabrics. Memorandum issued by Incorporated Association

of London Dyers and Cleaners on adulteration of dress silks. Useful tables. Nomenclature of stable hydrosulphites. Summary from Red Book No. 133. Index.

FARRINGTON, E. H., and WOLL, F. W. Testing Milk and Its Products: a manual for dairy students, creamery and cheese factory operators, food chemists and dairy farmers. 23d edition, revised and enlarged. 297 p. 12 mo. il. 1916. \$1.25

FAY, C. H. The Art of Lead Burning. 144 p. 8 vo. il. 1918. \$2.00

Reprint from "The Metal Worker, Plumber and Steam Fitter." The only treatise dealing exclusively with the subject.

FAY, HENRY. Microscopic Examination of Steel. 86 p. 8 vo. il. 1917. \$1.50

Author is Professor of analytical chemistry in the Massachusetts Institute of Technology and consulting engineer to the Watertown Arsenal. There are 18 pages of text, including brief directions for polishing and etching as well as a short list of books, also a number of photographic reproductions on heavy plate paper.

A reprint of material originally published by the U. S. Ordnance Department, representing the results of investigations at the Watertown Arsenal. The text is very brief and to the point, and the photographs are very good. It is a mere outline of metallographic methods illustrated by typical examples, and is intended particularly to help learners or workers in metallography who need some precise advice and instruction in the interpretation of results. It is admirably suited to serve this end, within the limits imposed. *Metallographical and chemical engineering, May 1, 1917.*

FAY, HENRY. Quantitative Analysis. 111 p. 8 vo. il. 1917. \$1.50

CONTENTS: Part I Mineral Analysis. Sampling; Determination of silica, potassium and sodium in silicates. Analysis of apatite iron ores; Determination of sulphur in pyrite, of titanium in titanium iron ores; Iodometric determination of copper; proximate analysis of coal. Part II—Metal Analysis. Analysis of phosphor bronze; Determination in steel of carbon, manganese, phosphorus, sulphur, copper, nickel, chromium, tungsten, vanadium. Determination of sulphur and silicon in cast iron; Atomic weights, Logarithmic tables.

FAY, IRVING W. The Chemistry of Coal-Tar Dyes. Second edition, revised and enlarged. 508 p. 8 vo. 1918. \$5.00 (Author is professor of chemistry at Polytechnic Institute, Brooklyn.)

CONTENTS: Coal-tar and its products. The hydrocarbons and their derivatives. The nitro and nitroso dyes. The triphenylmethane dyes. Classification of the coal-tar dyes. Azo dyes. Seven Food colors. Pyronines. Indomines. Indophenols. Thiazines. Oxazines. Eubodines and safranines. Quinoxalines, quinoline and acridine dyes. Aniline black. Alizarin dyestuffs. Indigo. Sulphur dyes. Mordants. Experimental work.

Intended for those dyers who have a good knowledge of general chemistry, and some knowledge of organic chemistry. The methods of making the dyes are taken up, followed by a study of the relations of the great classes of dyes, and also the individual dyes themselves, to one another in the same class. The development of one color from another by a change in its composition is explained, and tables showing the variation of color accompanying change of composition are included.

FERNALD, R. H., and ORROK, G. A. Engineering of Power Plants. By Robert H. Fernald, M.E., A.M., Ph.D., Whitney Professor of Dynamical Engineering, University of Pennsylvania, and George A. Orrok, M.E., formerly Mechanical Engineer, New York Edison Company, 581 p. 8 vo. il. 1916. \$5.00

A combination of material that has been developed during consulting practice and teaching. It aims, as a textbook (1) to emphasize that engineering, although based on the exact sciences, is not itself an exact science but requires, on the part of the successful engineer, a natural fund of "common sense" and the application of engineering judgments; (2) to give the student some understanding of the commercial side of engineering. It is an important reference work for practicing engineers.

CONTENTS: I.—Sources of energy. II.—The steam engine. III.—Electric generators and motors. IV.—Foundations. V.—Condensers. VI.—The steam boiler. VII.—Chimneys and mechanical draft. VIII.—Smoke and smoke prevention. IX.—Boiler auxiliaries. X.—Piping. XI.—Coal and ash handling. XII.—The steam power plant. XIII.—Variable load economy. XIV.—Cost of power. XV.—Hints on steam plant operation. XVI.—Power transmission. XVII.—District heating. XVIII.—The power plant of the tall office building. XIX.—The power plant of the steam locomotive. XX.—Fuels. XXI.—Internal combustion engines. XXII.—Producer gas and gas producers. XXIII.—Comparative efficiencies and operating costs for different types of installations. XXIV.—Compressed air. XXV.—Refrigerating machinery. XXVI.—Hydraulic power.

FERNBACH, R. L. Glues and Gelatine, a practical treatise on the methods of testing and use. 208 p. 8 vo. 1907. \$3.00

CONTENTS: Introductory. Classification and testing of glues. Analysis of glues and gelatine. Glue and gelatine substitutes. Foreign glues. Selection of glues for various industries. How glue should be used. Commercial and legal aspects. Manufacturing receipts. Analytical methods. Appendix.

FERRY, ERVIN S. A Handbook of Physics Measurements. By Ervin S. Ferry, Professor of Physics, Purdue University, in collaboration with O. W. Silvey, C. W. Sherman, Jr., and D. C. Duncan. Vol. I. Fundamental Measurements, Properties of Matter and Optics. 251 p. 8 vo. 146 figures. 1918. \$2.00

Furnishes the student of pure or applied science with a self-contained manual of the theory and manipulation of those measurements which bear most directly upon his subsequent work in other studies and upon his future professional career.

CONTENTS of Vol. I: I. General notions regarding physics measurements. II. Fundamental measurements and the properties of matter; III. Optics. Tables: 1. Conversion factors; 2. Densities of solids and liquids; 3. Specific gravities of water at different temperatures; 4. Specific gravities of aqueous solutions of alcohol; 5. Specific gravities of aqueous solutions at 15° C.; 6. Reduction of arbitrary hydrometer scales; 7. Specific gravities of gases and vapors; 8. Coefficients of friction; 9.

Elastic constants of solids; 10. Viscosities of water and aqueous sugar solutions; 11. The Greek alphabet; 12. Factor for reducing the volumes of a gas saturated with water vapor, and at various temperatures and pressures, to the volume at 30 inches of Mercury and 60° F.; 13. Values of  $\sin^2 \theta$  and  $\cos^2 \theta$ ; 14. Absolute index of refraction of various substances for the D line; 15. Index of refraction and dispersion of optical glasses; 16. Wave lengths of the prominent lines of the visible solar spectrum.

Vol. II. Vibratory Motion, Sound, Heat, Electricity and Magnetism. 233 p. 8 vo. 128 figures. Cloth, net, \$2.00

This book treats the measurements in the most available form for college and industrial laboratories. The mechanical engineer will be especially interested in the methods for the determination of the economy effected by steam-jacket coverings, and the thermal value of coal and gas.

CONTENTS OF VOL. II. Vibratory motion, Sound, heat, electricity and magnetism. Appendix. The sum of the series  $\cos x + \cos 2x + \cos 3x + \dots$ . Tables: The Greek alphabet, Corrections for the influence of gravity on the height of a barometer, Boiling point of water under different barometric pressures, Pressure of saturated aqueous vapor, Pressure of saturated mercury vapor, Coefficients of linear expansion of solids; Coefficients of cubical expansion of liquids, Heat values of various fuels, Specific heats of solids and liquids, Melting points and heat equivalents of fusion, Boiling points and heat equivalents of vaporization.

FERRY, ERVIN S., and others. Practical Pyrometry; the theory, calibration and use of instruments for the measurement of high temperatures by Ervin S. Ferry, Glenn A. Shook, and Jacob R. Collins. 147 p. 8 vo. il. 1917. \$1.50

A three years' testing of various methods and apparatus led to the organization of a course in high temperature measurements for students of chemical engineering at Purdue University. The present volume, based upon the notes used, is so arranged as to be of use not only to college students and to the technical expert, but to the less trained man who makes the measurements in practice.

CONTENTS. Standard temperature scales, Resistance pyrometry, Thermoelectric pyrometry, Radiation pyrometry, Optical pyrometry.

FERRY, ERVIN S. General Physics and Its Application to Industry and Everyday Life. Part I. Dynamics, Sound and Heat. 687 problems, 600 figures. 652 p. 8 vo. 1921. \$4.00

Designed for students who early in their college career require a co-ordinated elementary course in fundamental principles, methods and industrial applications of physics. No knowledge of algebra or mathematics is assumed beyond the elements of algebra and trigonometry.

CONTENTS: Dynamics; Fundamental notions of dynamics; Forces; Friction between solids; Motion of a body under the action of zero force; Motion of a body under the action of a constant force; Motion of a body under the action of a constant torque; Energy; Fluids; Properties of matter; Motion of a body under the action of a variable force; Wave motion; Sound; The nature of sound; Sounding bodies; Heat; Effects of heat; Convection and conduction; Thermodynamics.

FIERZ, HANS E. Basic Operations of Dyestuff Chemistry. About 325 p. 8 vo. il. In preparation. \$6.00

CONTENTS: Intermediates; Sulfonation; Nitration and reduction, Chlorination; Oxidation; Condensation; Dyestuffs; Azo dyestuffs, Triphenylmethane dyestuffs; Sulfur dyes; Various dyestuffs. Resume of various methods; Vacuum distillation in the laboratory and in the plant, Construction and use of autoclaves; Material of construction used in dyestuff production; Technical notes on plant operation, calculations; Analysis; Index.

FINDLAY, ALEXANDER. Chemistry in the Service of Man. By Alexander Findlay, M.A., D.Sc., Professor of Chemistry, University of Wales. Second edition. 288 p. 8 vo. il. 1917. \$3.75

CONTENTS: Introduction; Combustion and the production of fire, The chemistry of illuminants, Energy, fuel, and explosives, Cellulose and cellulose products, Velocity of reactions and catalysis, Fixation of atmospheric nitrogen; Glass, soda, soap; Electricity and chemistry, The colloidal state; Molecular structure, Synthetic chemistry, Fermentation and enzyme action; Index.

FINDLAY, ALEXANDER. Osmotic Pressure. (Monographs on inorganic and physical chemistry.) 1910. \$2.25

CONTENTS: Semi permeable membranes and osmotic pressures, Van't Hoff's theory of dilute solutions. Direct determination of the osmotic pressure of concentrated solutions. Discussion of the recent determinations of osmotic pressure and of the Van't Hoff theory. General theory of solutions. Discussion of the osmotic pressure of cane sugar. Indirect determination of the osmotic pressure. Bibliography. Index.

FINDLAY, ALEXANDER. The Treasures of Coal-tar. 137 p. 12 mo. il. 1917. \$2.00

CONTENTS: The production of coal-tar; The distillation of coal-tar; The constituents of coal-tar and their applications in the raw state; Molecular architecture. The production of dyes from coal tar, Azo dyes, Anthracene dyes and vat dyes; Indigo and its derivatives; Drugs, perfumes, and photographic developers; Explosives.

FINK, COLIN G. The Corrosion of Alloys. American Chemical Society Monograph. Ready about October 15th, 1921.

FINLAY, JAMES RALPH. The Cost of Mining. By James Ralph Finlay, Mining Engineer; Past Secretary and President, Mining and Metallurgical Society of America; Consulting Engineer, U. S. Bureau of Mines. Completely rewritten Third edition. 532 p. 8 vo. il. 1920. \$6.00

A discussion of the production of minerals, including a treatment of the geologic, social and economic foundations upon which this production rests.

CONTENTS: I. The source of power; II. Value of mining property; III. Nature and use of capital; IV. Factors governing variations of cost; V. Partial and complete costs; VI. Coal; VII. Cost of mining coal; VIII. Industrial clearing houses and statistics of iron production; IX. Lake Superior iron—Old Ranges; X. Cost of mining Lake Superior iron, Mesabi Range, and U. S. Steel; XI. Occurrence, production and prospects of copper; XII. Southwest copper field; XIII. Jerome and the Pre-Cambrian; XIV. Lake Superior copper mines; XV. Bismarck; XVI. The Porphyry coppers; XVII. Northwestern copper field; XVIII. Copper mines in various districts; XIX. Lead; XX. Southeast Missouri; XXI. Silver-Lead mining; XXII. Cost of silver-lead smelting; XXIII. Zinc statistics; XXIV. Zinc mining; XXV. Gold statistics, wars and

prices; XXVI. Occurrences and production of gold; XXVII. Quartz-Pyrite gold mines; XXVIII. Cripple Creek, Kalsporie and Goldfield, XXIX. Silver mining at Cobalt and Guanajuato.

FISCHER, EMIL. Introduction to the Preparation of Organic Compounds. Translated, with the author's sanction, from the new (eighth) German edition by R. V. Stanford. 194 p. 12 mo. \$1.50

CONTENTS: Part I.—Nitrobenzene, Aniline, Acetanilide, Thio-carbonilide, Phenyl mustard-oil,  $\beta$ -Phenylhydroxylamine, Nitro-sobenzene, Ethyl benzoate, meta-bromobenzoic acid, Benzoyl chloride, Benzamide, Diazobenzene nitrate, Diazoamidobenzene, Amidoazobenzene, Sulphanilic acid, Diazoacetic acid, Sulphonic acid, Helianthin, Phenyl hydrazine, Benzoinitrile, Monoethylamine, Nitroacetyl-methyl aniline, Hydrazobenzene and benzidine, Ethyl iodide, Aldehyde and aldehyde ammonia, Ethylene bromide, Glycol, Methylamine, Benzyl chloride, Benzaldehyde, Benzyl alcohol, Benzoin, Benzil, Benzoic acid, Cinnamic acid, Hydrocinnamic acid, Hexahydrobenzene, Acetic acid, Diacetoacetic ester, Diethyl malonate, Benzylmalonic ester, Benzylmalonic acid, Terephthalic acid, Pyruvic acid, Epi chlorhydrin, Acrolein, ortho- and para-nitrophenol, Picric acid, Anisole, Quinone and hydroquinone, Salicylic aldehyde,  $\beta$ -Naphthalene sulphonic acid,  $\beta$ -Naphthol, Naphthalene from naphthol (distillate with zinc dust), Potassium cyanate and urea, Alloxan and alloxazine, Quinoline, Hydrocollidine and collidine dicarboxylic esters,  $\alpha$ -Methylindol (methylketol), Diphenyl, Benzoylacetone, Benzophenone, Benzophenone oxime, Phenanthrene, quinone, Triphenylmethane, Triphenyl carbinol, Malachite green, Fluorescein and eosin, Anthraquinone, Alizarin, Camphor oxime, Part II.—Furfural, Grape-sugar, Mannose, Gluconic acid, Phenylhydrazide of gluconic acid, Saccharic acid, Mucic acid,  $\alpha$ -Glucosheptonic acid,  $\alpha$ -Glucosheptose, Dulcitol,  $\alpha$ -Methylglucoside, Glucosamine hydrochloride, Leucine, Phenylalanine, Tyrosine, Cystine,  $\beta$ -Naphthalene sulphoglycine, Glycocol ester and glycine-anhydride, Leucylglycine,  $\beta$ -Alanine and glycocoll esterhydrochloride. Approximate concentration of reagents. The preparation of 90 compounds is shown, and these have been selected because of their practical nature, such as the cost of materials and apparatus, the easiness, shortness and freedom from danger of the operations.

FISHER, HARRY L. Laboratory Manual of Organic Chemistry. 331 p. 8 vo. 1920. \$2.25

CONTENTS: Part I. 66 Laboratory Experiments. Part II. Organic Combinations. Division A: The Determination of Carbon and Hydrogen. Division B: The Determination of Nitrogen. Nitrogen Tables. Logarithms.

FISCHER, MARTIN H. The Colloid Chemistry of Soaps and Soap Manufacture. By Martin H. Fischer, Doctor of Medicine, Eichberg Professor of Physiology in the University of Cincinnati. 272 p. 8 vo. il. 1921. \$4.00

CONTENTS: The argument, Soap making; The system soap-water, The system soap-alcohol, Theory of the soap colloids, On the reaction of soaps to indicators, On the physical state of soap mixtures; On reversibility in soaps; On the analogy between the behavior of soaps and the behavior of certain proteins; The salting out of soaps, Definition of swelling, gelation, solution, separation and coagulation in colloid systems, The emulsifying and washing properties of soaps, Fillers for soaps, Filtration through soaps; Principles of hot and cold process soap manufacture.

FLANDERS, WILLIAM THOMAS, and others. Galvanizing and Tinning; a practical treatise on the coating of metal with zinc and tin by the hot dripping, electro galvanizing, sherardizing and metal spraying processes, with information on design, installation and equipment of plants. 350 p. 8 vo. Third edition. 1921. \$4.00

It is stated that the author has had the cooperation of seven well known experts who were broadminded enough to put the needs of the trade above their personal desire for gain through secrecy. An exceptionally complete and practical work for those engaged in the shop, or in preparing plans for new plants. Has a good trade directory.

FLEMING, LOUIS ANDREW. Practical Tanning; a handbook of modern processes, receipts, and suggestions for the treatments of hides, skins and pelts of every description, including various patents relating to tanning, with specifications. Third edition. 594 p. 8 vo. 1916. \$6.00

A thorough revision of this well known work. Although the trade paper upon which it is stated, it is stated that nothing is contained which has previously appeared in the books of other English or American authors. Thoroughly practical, it aims "to give the details of tanning processes with such clearness and precision that nothing further in the way of explanation is required."

CONTENTS: Section I.—The manufacture of sheepskin leathers, II.—The manufacture of calfskin leathers, III.—The tanning and dyeing of furs and hair skins, IV.—The manufacture of goatskin leather, V.—Some practical methods of bleaching leather, VI.—The manufacture of kangaroo leather, VII.—The manufacture of leathers from cowhides, VIII.—Processes, receipts, formulas and notes. Notes and suggestions on chrome tanning, IX.—Receipts, formulas and processes.—continued Appendix. Various patents relating to tanning, with specifications. Index.

FLEURY, P. The Preparation and Uses of White Zinc Paints. Translated from the French by Donald Grant. 179 p. 12 mo. il. 1912. \$3.00

CONTENTS: Painting on Woodwork. Better Class Painting on Woodwork. Painting on Plaster, on Mortar, and on Soft and Porous Ceilings; Hints on Painting with White Zinc; Testing Commercial Zinc Whites. The Experiments on the Dutch Commission Officially Entrusted to Make Comparative Trials between White Lead and White Zinc; Results and Criticisms of the Experiments of the Dutch Commission; Final Report of October 5, 1909; Manufacture and Different Treatments of White Zinc—Its Modifications and Improvements; The Legislative History of White Zinc Paint; Legislation. Methods of Qualitative Analysis. Examination of Paints; Fixed and Essential; Oils; Waxes; Formula for Encaustic and Waterproof Paints; Analysis of Paints; White Paints; White Lead and White Zinc; Blacks; Red Pigments; Carmine and Lakes; Yellow Colors; Green and Blue Pigments; Brown Colors; Binders or Liquids; Testing Preservation and Improvement of Varnishes by Aging; Analysis of Yellow and White Wax; Selected Furniture Polish Recipe. Normal Polish for Floors, Parquet and Woodwork; Virgin Wax Polish for Polishing of Paints or Polishing of Varnishes; Formula for a Waterproof Composition for Plaster and Stone and Damp Walls; Special and More Economical Formula for Waterproofing Plaster.

**FLINN, ALFRED DOUGLAS, and others, compilers. Water-works Hand Book.** compiled by Alfred Douglas Flinn, Robert Spurr Weston, and Clinton Lathrop Bogert. 824 p. 8 vo. il. 1916. **\$6.00**

**CONTENTS:** SOURCES OF WATER SUPPLY. Rainfall or precipitation. Evaporation. Run-off and stream-flow. Ground water. COLLECTION OF WATER. Intakes. Watershed development by reservoirs. Masonry dams. Rockfill dams. Earth dams. Wells. Infiltration galleries. Notes on some equipment for treating water. TRANSPORTATION AND DELIVERY OF WATER. Open channels. Aqueducts. Plate metal pipes. Wooden pipes. Reinforced concrete pipes. DISTRIBUTION OF WATER. Cast-iron pipe and specials. Distribution systems. Valves, sluice gates, hydrants. Service meters. Pumps, pumping stations and equipment. Distribution reservoirs, standpipes and tanks. Water consumption. Hydraulic computations. Masonry and puddle. Non-ferrous metals (also corrosion of iron and steel). Capacity and conversion tables. Miscellaneous. CHARACTER AND TREATMENT OF WATER. Character of water. Inspection of sources of supply. Storage of water and improvement of reservoirs. Sedimentation. Aeration and chemical treatment. Water softening. Preliminary filtration and defecation. Filtration. Examination of water.

**FLINT, W. R. Chemistry for Photographers.** 205 p. 12 mo 1916. **\$2.00**

**FOLTZER, JOSEPH. Artificial Silk and Its Manufacture.** Translated from the French by T. Woodhouse. 8 vo. il. 256 p. 1921. **\$7.50**

**CONTENTS:** Preface. Introductory. Cellulose; The mercerizing of vegetable fibers and fabrics. Origin of artificial silk. Chardonnet artificial silk; Desperis artificial silk (Cuprammonium process). Solutions and apparatus for mixing. The spinning mill. The cleaning of spinnerets or capillary tubes; Washing, filtration of water, and soap washing. Drying, humidification, and ventilation. Winding, twisting, reeling and counting, waste, viscose artificial silk threads and other products. Luster artificial silk; The recovery of by-products in the Cuprammonium process. Solutions of cellulose, and the preparation of solvents. Precipitating liquids. Spinning, twisting, removal of copper, washing and drying of threads; The spinning of artificial silk on continuous machinery. Other imitations of natural silk, and the apparatus for producing them; Organization of staff and equipment for an artificial silk mill; General notes on the establishment of an artificial silk mill. Distinctive characteristics, properties and uses of natural and artificial silks. Dyeing; The conversion of cellulose into artificial hair, thread, ribbons, felt, leather, films, wall decorations and cloths for flowers, bookbinding, waterproofing and ordinary textures. Index

**FOLWELL, AMORY PRESCOTT. Sewerage; the designing, construction, and maintenance of sewerage systems.** 540 p. 8 vo. il. 1916. **\$4.00**

This rewritten edition, which has been brought strictly up to date, devotes more space than heretofore to the calculating of the sizes of sewers, especially of storm sewers, the pumping of sewage, etc.

**CONTENTS:** PART I.—SEWERAGE SYSTEMS. General outline of subject. Amount of house sewage. Amount of storm sewage. Flow in sewers. Flushing and ventilating. Sewer appurtenances. Collecting the data. Designing. Detail plans. Specifications and contract. Supervision of construction. Construction. Maintenance. PART II.—SEWAGE DISPOSAL. Disposal by dilution. Removing suspended matter. Oxidation methods. Other Treatment methods.

**FOLWELL, A. P. Water-Supply Engineering.** The designing, construction, and maintenance of water-supply systems, both city and irrigation. By A. Prescott Folwell. Editor Municipal Journal and Engineer. Third edition, rewritten. 584 p. 8 vo. il. 1917. **\$4.00**

Covers every feature of the supplying of water for municipalities. The present edition contains much new matter and embodies the most recent practice and discoveries.

**CONTENTS:** Requisites of a water supply; Quantity, quality. Purification of water. Source of supply. Rainfall. Surface water. Rivers and lakes. Ground water. Gravity systems. Pumping systems. Pumping and pumping engines. Dams and embankments. Designing. Supervision and measurement of work. Practical construction

**FOOT, F. N. Baking Powder and Other Leavening Agents.** 88 p. 12 mo. 1908. **\$1.50**

**FORT, M., and LLOYD, L. L. The Chemistry of Dyestuffs;** a manual for students of chemistry and dyeing. 311 p. 8<sup>vo</sup>. il. 1917. **\$2.50**

A compact syllabus covering the main facts for the preparation of intermediate compounds and of dyestuffs. Has chapters on tar distillation, the application of dyestuffs, and the relation of colour to constitution. Diagrams of apparatus are given in the appendix. A thorough knowledge of pure chemistry is presupposed on the part of the reader.

**FOSTER, HORATIO A. Engineering Valuation of Public Utilities and Factories.** 361 p. 8 vo. 1912. **\$3.00**

**FOSTER, HORATIO A. Electrical Engineer's Pocketbook.** A handbook of useful data for electricians and electrical engineers. With the collaboration of eminent specialists. Seventh edition, completely revised. 1636 p. 16 mo. il. 1913. **\$5.00**

The book as now presented shows some corrections of typographical and other errors, together with some new material in the sections on switchboards and units, while the standardization rules of the A. I. E. E. included are the latest. The aim throughout has been to supply in exhaustive and condensed form the data essential to the engineer engaged in any of the branches of the vast domain of electrical engineering.

**FOULK, C. W. Quantitative Chemical Analysis.** By Charles W. Foulk, Professor of Analytical Chemistry, Ohio State University. Third edition, revised and enlarged. 250 p. 8 vo. il. 1913. **\$3.00**

A complete general treatise, aiming to emphasize the general aspects and points, rather than a succession of methods.

**FWOLE, F. F. (Editor). Standard Handbook for Electrical Engineers.** Prepared by a staff of specialists. Frank F. Fowle, Editor-in-Chief. Fourth edition, third impression, with corrections, and revision of the Standardization Rules to January, 1917. 2,000 p. 16 mo. il. 1917. Flexible binding, full gilt, thumb indexed. **\$7.00**

The fourth edition of the Standard is a new book—revised, rewritten and entirely recast. It is the joint production of over 60 of the leading engineers in the field. It is a handbook written for engineers in practice. There are 25 sections with the subject matter grouped so that you can find all the material on a given subject in one section. There are 2,000 pages, but the use of special paper has kept this book down practically to the bulk of the third edition. Every subject is fully and carefully indexed for quick reference.

**FWOLE, F. E. Compiler. Smithsonian Physical Tables.** 355 p. 8 vo. 1914. **\$2.00**

**FWOLE, C. E. Law and Business of Engineering and Contracting.** With numerous forms and blanks for practical use. By Charles F. Fowler, C.E. 162 p. 8 vo. il. 1909. **\$2.50**

The book is based on a sound knowledge of contract law plus a long practical experience in engineering. Important chapters cover the principal kinds of insurance with forms of policies, the formation and operation of corporations, and the organization and inspection of work.

**CONTENTS:** Chapter I.—Relation between the engineer and contractor. II.—Ordinary forms of contracts. III.—Ordinary specifications. IV.—Special forms of specifications. V.—Special forms of contracts. VI.—Inspection of engineering work. VII.—Estimating materials and the cost of engineering structures. VIII.—Bidding on engineering work. IX.—Organization of contract work. X.—Essentials of contract law.

**FWOLE, GILBERT. An Introduction to Bacteriological and Enzyme Chemistry.** By Gilbert J. Fowler, D.Sc., Lecturer in Bacteriological Chemistry, Victoria University in Manchester. Second impression. 336 p. 8 vo. il. 1911. **\$2.75**

Apart from its well-known applications in the fermentation industries, Dr. Fowler discusses the bearing of bacteriological and enzyme chemistry upon the questions of sanitation, especially the provision of pure water and the inoffensive disposal of sewage, and the general applications in the industries and in agriculture. The writer has had in mind, not only the sanitary officer, but also the general practitioner and the student of sanitary science.

**FRANKE, G. A Handbook of Briquetting.** In two volumes. Vol. I.—The Briquetting of Coals, Brown Coals, and Other Fuels. 631 p. 9 plates. 225 illustrations in the text. 8 vo. **\$10.50**

**CONTENTS:** Introduction. Part I—The Preparation of Coal Briquettes. Part II—The Preparation of Brown Coal Briquettes and Well-Compressed Blocks. Appendix. Supplement.

Vol. II.—Briquetting of Ores, Metallurgical Products, Metal Swarf and Similar Materials, Including Agglomeration. With appendices. 214 p. 4 plates. 79 illustrations in the text. 8 vo. **\$4.50**

**CONTENTS:** Part III—Briquetting of Ores. Metallurgical products, metal swarf and similar materials, including agglomeration.

**FRANKLIN, E. C. Liquid Ammonia as a Solvent.** American Chemical Society Monograph. In preparation.

**FRAPS, G. S. Principles of Agricultural Chemistry.** By G. S. Fraps, Ph. D., Associate Professor of Agricultural Chemistry, Agricultural and Mechanical College of Texas, College Station, Texas; Chemist, Texas Experiment Station; State Chemist. 501 p. 8 vo. il. 1917. **\$5.00**

**CONTENTS:** Chapter I.—Introduction. II.—Essentials of plant life. III.—The Plant and the atmosphere. IV.—Origin of soils. V.—Physical composition and classes of soils. VI.—Physical properties of soils. VII.—The soil and water. VIII.—Chemical constituents of the soil. IX.—Chemical composition of the soil. X.—Active plant food and water soluble constituents of the soil. XI.—Chemical changes in the soil. XII.—Soil deficiencies. XIII.—Losses and gains by the soil. XIV.—Manure. XV.—Sources and composition of fertilizers. XVI.—Purchase and use of fertilizers. XVII.—Constituents of plants. XVIII.—Composition of plants. XIX.—Digestion. XX.—Utilization of food. XXI.—The maintenance and fattening of rations. XXII.—Feeding work animals and growing animals. XXIII.—Feeding milk cows. XXIV.—Calculation of rations.

**FRARY, F. C. Laboratory Manual of Glass-Blowing.** By Francis C. Frary, Ph.D., formerly Assistant Professor of Chemistry, University of Minnesota. 60 p. 12 mo. il. 1914. **\$1.00**

A clear and detailed discussion of the elements of glass-blowing for workers in physical and chemical laboratories.

**FRAZER, PERSIFOR and BROWN, AMOS PEASLEE. Tables for the Determination of Minerals by Physical Properties.** Based on the system of the late Dr. Albin Weissbach. Sixth revised edition. 12 mo. 1910. **\$2.50**

This volume was prepared as a means to assist in the diagnosing of minerals, the diagnosis, in the main, being based upon their outward characteristics.

The minerals have been divided into three tabular systems, of which the first embraces those of metallic lustre, the second those of non-metallic lustre which give a colored powder; and lastly, the third contains all minerals of non-metallic lustre and colorless streak. These three systems of tables fall again into single tables (for example, the first into five), in which the minerals are arranged according to their hardness, i.e. the softest are first, and the hardest last.

**FRENCH, T. E. Engineering Drawing.** By Thomas E. French, M.E., Professor of Engineering Drawing, the Ohio State University. 289 p. 8 vo. il. 1911. **\$3.00**

This book is unusual because of its broad scope, its thoroughness and balance of treatment, and its logical and tropical arrangement. It was designed for men in every branch of engineering. It was written by a man of broad teaching and practical experience, assisted by a staff of specialists. It is a crisp, clear statement, with exceptionally fine illustrations.

**FRESENIUS, C. R. Quantitative Chemical Analysis.** By the late Dr. C. Remigius Fresenius, Privy Aulic Counsellor; Director of the Chemical Laboratory at Wiesbaden. Authorized and greatly amplified translation of the revised sixteenth German edition by Alfred I. Cohn, Ph.D., 2 volumes. 2035 p. 8 vo. il. 1903. **\$12.50**

When sold separately: Vol. I.—\$5.50. Vol. II.—\$7.50.  
A comprehensive treatise in which the most recent and improved methods of analysis have been incorporated. The work comprises three parts: I. General, dealing with the execution of the analysis, reagents, determination and separation of bodies, organic elementary analysis. II—Special, including the analysis of waters, technical and industrial products, plant ashes, soils, manures, air. III—Exercises for practice. It also presents an appendix comprising analytical experiments and tables for calculating analytical results.

**FRESENIUS, H. W., and MITCHELL, G. A.** Introduction to Qualitative Chemical Analysis. By H. Wilhelm Fresenius. 17th Edition of the Original Work by C. Remigius Fresenius. Translated by G. Ainsworth Mitchell, M.A. (Oxon.), F.I.C., Editor "The Analyst." 954 p. 8 vo. il. 1921. \$8.00

This seventeenth edition of the standard work of Fresenius has been completely remodeled to make it conform with the modern conceptions of chemistry. A chapter dealing with reagents, which appeared in former editions, has been omitted as being no longer necessary, whilst the notes and additions to the systematic course have been transferred to a separate chapter. At the same time the principles of the analytical systems used in the course are made clearer by the addition of tables and general surveys of each stage.

CONTENTS: Part I—General Chemical Principles and Methods of Analytical Chemistry. Behavior of substances to reagents; Reactions of cations, Reactions of anions. Part II—Systematic Course of Qualitative Chemical Analysis. Practical methods of the general course, Practical methods for special cases; Explanatory notes and additions to the practical process. Appendix: Behavior of the most important alkaloids towards reagents, and systematic course for their identification. Remarks on the correct choice of exercises for practice; Tabulation of the results obtained with the substances analyzed for practice; Solubility tables.

**FREUND, IDA.** Experimental Basis of Chemistry. 808 p. 8 vo. 1920. \$9.00

CONTENTS: Part I. The Proportions of Science. The Subject Matter of Science, The Nature of Laws, The Discovery and Proof of Laws, The Explanation of Laws, Theories, Chance and Probability; The Meaning of Science; Science and Philosophy.

CONTENTS: Part II. Measurement. Fundamental Measurement; Physical Number; Fractional and Negative Magnitudes; Numerical Laws and Derived Magnitudes; Units and Dimensions, The Uses of Dimensions, Errors of Measurement; Metrical Errors; Errors of Consistency and Adjustment of Observations; Mathematical Physics, Appendix; Index.

**FRIEND, J. NEWTON.** A Textbook of Inorganic Chemistry. 8 vo.

Vol. 1. Part 1. An introduction to modern inorganic chemistry, by J. Newton Friend, H. F. V. Little, and W. E. S. Turner. Part 2. The inert gases, by H. Vincent Briscoe. 385 p. il. 1915. \$4.50

CONTENTS: The periodic table. General introduction to the series. Preface to Part I. Preface to Part II. Part I.—Introduction to modern inorganic chemistry. The fundamentals of chemical science. General properties of elements and compounds. Solubility, solution, and some properties of solutions. Molecular weight and its determination. Chemical change. Acids, bases and salts. The determination of atomic weights and equivalent or combining weights. Classification of the elements. Part II.—The inert gases. Introduction. Helium. Neon. Argon. Krypton. Xenon. Niton. Name index. Subject index.

Vol. 4. Aluminum and its congeners, including the rare earth metals, by H. F. V. Little. 486 p. il. 1917. \$5.00

Vol. 5. Carbon and its allies, by R. M. Caven. 468 p. il. 1918. \$5.00

Vol. 8. The halogens and their allies, by Geoffrey Martin and E. A. Dancaster. 337 p. il. 1916. \$4.00

A treatment of the seventh group of the periodic table, comprising the halogens and manganese, together with their compounds. The most important manufacturing operations are described.

CONTENTS: Introductory. Fluorine and its compounds. Chlorine and its compounds. Bromine and its compounds. Iodine and its compounds. Manganese and its compounds. Name index. Subject index.

Vol. 9. Part 1. Cobalt, nickel and the elements of the platinum group. 367 p. il. 1920. \$6.00

Vol. 9. Part 2. Iron and Its Compounds. 265 p. il. 8 vo. 1921. \$7.50

CONTENTS: The Early History of Iron, The Mineralogy of Iron, Preparation and Properties of Pure Iron, The Corrosion of Iron, General Properties of Iron Salts, Compounds of Iron with Hydrogen and the Halogens, Iron and the Elements of Group VI, Iron and the Elements of Group V, Iron and the Elements of Groups IV and III, Detection and Estimation of Iron.

**FRIEND, J. NEWTON.** An Introduction to the Chemistry of Paints. By J. Newton Friend, Ph.D., D.Sc., Fellow of the Chemical Society, Member of the Iron and Steel Institute. 214 p. 8 vo. 1910. \$1.75

That it is quite possible to give a thorough discussion of the chemistry of paints, without mentioning symbols, formulae, atomic weights, etc., is proved by this volume, but for the sake of those who may wish to pursue any branch of the subject further, references are given to more advanced literature and to original papers.

**FRIEND, J. NEWTON.** The Chemistry of Linseed Oil. 93 p. 12 mo. 1917. \$1.00

CONTENTS: Introduction; The manufacture of linseed oil; The chief constituents of linseed oil; Properties and reactions of linseed oil; The chemistry of linseed oil and linoleic; Polymerised and oxidized oils; Bibliography and notes.

**FRIEND, J. NEWTON.** The Corrosion of Iron and Steel. 314 p. 12 mo. 1911. \$2.50

The object of the present work is to present a concise account of all the important work that has been done in connection with the corrosion of iron, and to enable the expert, by means of the numerous references, to come into direct contact with all the important original contributions to the subject, and to learn along what lines further research is necessary.

**FRITSCH, J.** The Manufacture of Chemical Manures. Translated from the French, with numerous notes by H. B. Stock. Second edition, revised and enlarged. 395 p. 8 vo. il. 1920. \$6.00

CONTENTS: Phosphoric Acid. Principal Phosphate Deposits. Drying and Enrichment of Phosphates. Historical Review of Superphosphate Manufacture. Theory of Manufacture of Soluble Phosphate Superphosphate Manufacture. Crushing, Sifting, Drying, and Storing of Superphosphate. Retrogradation Compound Manures. Manufacture of Phosphoric Acid. Double Superphosphates and Various Products. Manufacture of Bone Dust and of Bone Superphosphate (Vitriolized Bones). Manufacture of Basic Slag. Nitrogenous Manures. Manufacture of Manure from Animal Waste. Recovery of Nitrogen from Distillery Spent Wash. Manufacture of Cyanamide and of Nitrate of Lime. Nitrogenized Phosphatic Manures. Potassic Manures. Transference and Handling of Raw Materials and Finished Products.

**FRYER, P. J., and WESTON, F. E.** Technical Handbook of Oils, Fats and Waxes. v. 1. 8 vo. 1917. \$2.75

A concise handbook "designed to meet the needs of the technical worker and the works chemist."—Preface. Gives physical and chemical composition.

**FULLER, G. W.** Sewage Disposal. By George W. Fuller, Consulting Engineer and Sanitary Expert; Mem. Am. Soc. C.E., etc. 767 p. 8 vo. il. 1912. \$7.00

A comprehensive work full of concrete facts, with a comparison of values and data on methods. It is the product of the author's twenty-five years' association with this branch of sanitary work. It became at once the leading American book on sewage disposal.

**FULLER, HENRY C.** Chemistry and Analysis of Drugs and Medicines. By Henry C. Fuller, B.S., in charge Division of Drug and Food Products, Institute of Industrial Research, Washington, D. C. 1072 p. 8 vo. il. 1921. \$10.00

CONTENTS: Part I—General Methods and Crude Drug Assays. Part II—Alkaloidal Drugs, Alkaloids and Medically Allied Substances. Definition and general methods of separation and identification; Alkaloids derived from pyridin, from pyrrolidin, from quinolin, from isoquinolin; Alkaloids which probably contain a pyridin nucleus; Alkaloids with no pyridin nucleus and those of unknown composition. Part III—Glucosides. Glucosidal Drugs and Natural Drugs Containing Principles Other Than Alkaloids. Glucosides; Purgative drugs; Miscellaneous actur drugs; Botanical drugs; Gums and resins. Part IV—Organic Substances Other Than Alkaloids or Glucosides. Hydrocarbons; Alcohols; Ethers; Aldehydes and ketones; Organic acids, Etheral salts and phenols; Synthetic organic nitrogen compounds; Anilides and phenetindines. Organic arsenicals; Proteins and digestives. Oils. Part V—Inorganic Section. Methods of identification; Non-Metals and their compounds; Metals and their compounds.

**FULLER, HENRY C.** The Qualitative Analysis of Medicinal Preparations. By H. C. Fuller, B.S. Second edition. 191 p. 8 vo. 1921. \$2.95

Gives many practical and reliable schemes for separating and identifying substances in medicinal products.

CONTENTS: First Portion: Scheme of analysis; Separation of substances into groups. Tables of reactions of anesthetics and opium alkaloids. Second Portion: Analysis of extracts, tinctures, elixirs, emulsions, tooth washes, gargles, pills, powders, effervescent preparations, pastes, ointments, plasters, digestives, etc.

**FULTON, C. H.** Principles of Metallurgy. 544 p. 8 vo. 1910. \$6.00

CONTENTS: The metals and metallurgy from the historic point of view. Physical mixtures and thermal analysis. Physical properties of metals. Alloys. The physical properties of alloys. The measurement of high temperature. Typical metallurgical operations. Slags, Matte, bullion and speise, refractory material for furnaces. Fuels. Combustion. The production and heating of blast furnaces. An example illustrating the physics and chemistry of a smelting operation; The blast furnace for copper.

**GAGE, SIMON H.** The Microscope. 472 p. 8 vo. 1917. \$3.00

A guide for every one who uses the microscope. This new edition discusses the perfected forms of darkground illumination.

**GAMBLE, WILLIAM.** Photography. (Pitman's Common Commodities and Industries.) 132 p. 12 mo. il. 1920. \$1.00

CONTENTS: The discovery of photography; The camera and lens; Dark-room and its equipment; The sensitive plates; Wet collodion process; The sensitive plates; Collodion emulsion and dry plates; Making the exposure; Development and after-treatment of the plate; Printing processes; Printing processes. Carbon and other methods; Enlarging, copying, and lantern slide making; Color processes; Scientific application of photography; Cinema photography; Photo-mechanical processes; Industrial application of photography; Photography in warfare.

**GARCIA, A. J. R. V.** Dictionary of Railway Terms in Spanish-English and English-Spanish. 350 p. 8 vo. 1922. \$3.00

A Spanish-English and English-Spanish dictionary containing not only the principal terms, but all the rare words as well as those of recent origin that concern railway enterprise, the details of the laying of the line, the rolling stock from its trucks and wagons to its luxurious dining cars, and the stations with their hotels, garages and dependencies. Special terms that in Cuba, Mexico and South America differ from those used in Spain are also included.

**GARDNER, HENRY A.** Paint Researches and Their Practical Applications. 363 p. 8 vo. il. 1917. \$5.00

CONTENTS: Growth of the prepared paint industry and its relation to the work of the painter; White pigment industry; Physical characteristics of pigments and paints; Tests of lithopone; Washington paint oil tests; Paint protection for Portland-cement surfaces; Paints to prevent electrolysis in concrete structures; Paints for metal, marine paints; Arlington paint tests; Observations on painted lumber; Impregnated panel tests; Fire retardant paints for shingles and other wooden structures; Composition of paint vapors; Toxic and antiseptic properties of paints; Light-reflecting values of white and colored paints; Formation and inhibition of mildew in paints; Fungi on painted sur-





# 1252 TECHNICAL AND SCIENTIFIC BOOKS SECTION

**GILL, A. H. Engine Room Chemistry.** 212 p. 12 mo. 1913. \$1.50

CONTENTS: Preface. Introduction. Apparatus and chemicals. Fuels and their analysis. The regulation of combustion. Gas analysis. Examination of certain oils. Petroleum products. Vegetable oils. Animal and vegetable oils. Appendix. Index.

**GILL, A. H. Gas and Fuel Analysis for Engineers.** 145 p. 12 mo. 1917. \$1.50

CHAPTERS: Sampling. Suction apparatus. Gas holders. Apparatus for the analysis of chimney gases. The measurement of temperature. Calculations. Apparatus for the analysis of fuel and illuminating gases. Preparation of reagents and arrangements of the laboratory. Fuels. Solids, liquid and gaseous, their derivation and composition. Analysis and determination of heating value. Tables and specifications.

**GILL, A. H. A Short Hand-Book of Oil Analysis.** Eighth edition, revised and enlarged. 128 p. 12 mo. il. 1918. \$2.50

CONTENTS: Part I. Physical and chemical tests. Petroleum products. Chemical tests. Animal and vegetable oils. General considerations regarding lubricants. Part II. Derivation, description, and examination of certain oils. Petroleum products. Vegetable oils. Animal oils. Waste fats. Appendix. Index.

**GILLETTE, H. P., and DANA, R. T. Handbook of Mechanical and Electrical Cost Data.** By H. P. Gillette, Editor, Engineering and Contracting, and R. T. Dana, Mem. Am. Soc. C.E., Am. Soc. Eng. Cont., A.I.M.E. 1500 p. 12 mo. 1918. \$6.00

A complete cost data book for engineers. The net prices, shipping weights, etc., of machines and appliances of many types, classes and sizes are given, together with costs of installation and operation. The costs are in such detail, with a record of governing conditions, that they are invaluable aids in making estimates and indispensable as a guide for the economical operation of existing plants. Rates of wages and prices of materials are stated so that a proper substitution may be made for times and communities where different conditions prevail.

CONTENTS: I. General economic principles. II. Depreciation, repairs and renewals. III. Buildings. IV. Chimneys. V.—Moving and installing. VI. Fuel and coal handling. VII. Steam power. VIII.—Internal combustion engines and gas producers. IX.—Hydro-electric plants. X. Complete electric light and power plants. XI.—Overhead electric transmission. XII. Underground electric transmission. XIII. Lighting and wiring. XIV. Belts, shafts, pulleys, pipe and miscellaneous power transmission. XV.—Compressed air. XVI.—Gas plants. XVII. Pumps and pumping. XVIII.—Conveyors and hoists. XIX. Heating, ventilating and refrigeration. XX.—Electric railways. XXI. Miscellaneous.

**GIOLITTI, FEDERICO. Heat Treatment of Soft and Medium Steels.** Translated by F. E. Thum and D. G. Vernaci. 374 p. 8 vo. 214 il. 1921. \$5.00

The first systematic discussion of the effect of various impurities and addition agents on commercial heat treatment. Dr. Giolitti proves in this book the tremendous advantages to be gained by the elimination or suppression of these impurities and addition agents. If for nothing else, Dr. Giolitti's book is of great importance for its insistence that commercial heat treatment of steel depends primarily upon the diffusion of carbon and other soluble substances contained, gaseous or solid.

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**GISSING, FREDERICK L. Commercial Peat: its use and its possibilities.** 191 p. 8 vo. il. 1916. \$2.50

**GIUA, M., and GIUA-JOLLINI, C. Chemical Combination Among Metals.** Translated by Gilbert W. Robinson. 355 p. 8 vo. il. 1918. \$4.50

CONTENTS: Equilibrium diagrams. Thermal analysis. The nature of intermetallic compounds; Physical properties. Homopolar intermetallic compounds. Heteropolar intermetallic compounds. Ternary intermetallic compounds. Tables.

**GIVEN, A. Methods for Sugar Analysis and Allied Determinations.** 75 p. 8 vo. il. 1912. \$2.00

A concise and valuable book for laboratory use of food, drug and dairy chemists and for manufacturers and chemists in lines of food and other sugar containing products. By Arthur Given, B.S., formerly Assistant Chemist, Sugar Laboratory, Bureau of Chemistry, U. S. Dept. of Agriculture; Formerly Assistant Chemist, New Hampshire Agricultural Experiment Station, Chemist for the Cuban Sugar Refining Co., etc.

**GLAISTER, JOHN, and LOGAN, D. D. Gas Poisoning in Mining and Other Industries.** 471 p. 8 vo. 1914. \$3.50

Contains 12 p. of bibliography.

**GOLDINGHAM, A. H. Design and Construction of Oil Engines.** Fourth edition, enlarged. 260 p. 12 mo. il. 1914. \$2.50

CONTENTS OF CHAPTERS: 1.—Introductory. 2.—On designing oil engines. 3.—Testing oil engines. 4.—Cooling water tanks and other details. 5.—Oil engines driving dynamos. 6.—Oil engines connected to air-compressors, water-pumps, ice and refrigerating machines. 7.—Instructions for running oil engines. 8.—Repairs. 9.—Oil engine troubles. 10.—Various engines described. 11.—Portable oil engines. 12.—Large sized oil engines. 13.—Fuels, analyses and tables. 14.—Miscellaneous tables, fire insurance, etc. 15.—Marine Diesel engines. 16.—Various types of marine Diesel engines. 17.—Large stationary Diesel engines. Index.

**GOLDINGHAM, A. H. Marine and Stationary Diesel Engines: described and illustrated, with numerous formulae for the design and directions for their installation and operation.** 206 p. 12 mo. il. \$3.00

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**GOODELL, F. R. Tire Making and Merchandising,** with chapters on rubber. Second edition. 12 mo. il. 1921. \$3.00

**GOODENOUGH, G. A. Properties of Saturated and Superheated Ammonia Vapor.** Bulletin 66, Engineering Experiment Station, University of Illinois. 94 p. 8 vo. 1913. \$0.50

**GOODENOUGH, G. A. Properties of Steam and Ammonia.** By G. A. Goodenough, M.F., Professor of Thermodynamics, University of Illinois. Second edition. 126 p. 8 vo. il. 1917. \$1.60

A new set of tables based on the latest and most accurate experimental data. The tables of superheated and saturated steam are based on a new formulation, are consistent and exceedingly accurate.

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**GOODENOUGH, G. A. Thermal Properties of Steam.** Bulletin 75, Engineering Experiment Station, University of Illinois. 69 p. 8 vo. 1914. \$0.25

**GOODRICH, W. FRANCIS. Modern Destructor Practice.** 278 p. 8 vo. il. 1912. \$4.75

An experience of nearly twenty years in combustion engineering and an intricate knowledge of the many problems which have had to be faced in the evolution of the Modern Refuse Destructor during the past eighteen years, makes it possible for the author to express some very definite opinions and to discuss much which is of a controversial nature.

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**GORE, G. The Art of Electrolytic Separation of Metals.** 317 p. 8 vo. il. 1890. \$4.50

CONTENTS: Chief Electrical Facts and Principles. Thermal Phenomena of the Electrolytic Separation of Metals. Chemical Facts and Principles; Chemico-electric or Voltaic Action; Electrochemical Action; Generation of Electric Current by Dynamo Electric Machines; Establishing and Working an Electrolytic Copper Refinery; Other Applications of Electrolysis in Separating and Refining Metals.

**GOULD, GEORGE M. Practitioner's Medical Dictionary.** Third edition. Entirely reset from new type. Revised and enlarged by R. J. E. Scott. 962 p. 8 vo. 1916. \$4.50

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**GOULDING, ERNEST. Cotton and Other Vegetable Fibres;** their production and utilization, with a preface by W. J. Dunham. R. Dunstan. 230 p. 8 vo. il. 1917. \$3.00

The Imperial Institute has for many years investigated the possibilities of fibre production in all of those British countries which seem to present chances of success. Much of this work has been experimental. The present volume gives information concerning the world's production of cotton, flax, hemp, ramie, jute, cordage, and miscellaneous fibres, with information on cultivation, preparation, commercial value, etc.

**GOWLAND, WILLIAM. The Metallurgy of Non-Ferrous Metals.** 496 p. 8 vo. il. 1918. \$8.50

One of a series of treatises written by associates of the Royal School of Mines.

This modern treatment, of infinite value to metallurgical students and practical workers in the field of non-ferrous metals, clearly defines the principles on which the various processes which cover the modern work in non-ferrous metals are carried on. To be up to date in the profession you should have knowledge of the latest ideas elucidated in this volume.

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**GRADWOHL, R. B. H., and BLAIVAS, A. J. The Newer Methods of Blood and Urine Chemistry.** Second edition, revised and enlarged. 418 p. il. 1917. \$5.00

**GRANJON, R., and ROSEMBERG, P. A Practical Manual of Autogenous Welding (Oxy-Acetylene);** with a chapter on the cutting of metals with the blowpipe. Seventh edition. 260 p. 12 mo. il. 1918. \$2.80

CONTENTS: The different methods of making permanent metallic joints. Autogenous welding with blowpipes. Is autogenous welding of any application? In what cases should it be employed? Oxygen. Acetylene. Oxy-acetylene blowpipes. Welding installations. Working of welding installations. Properties of metals. Metals and materials added. Autogenous welding of steel, cast iron, copper, brasses and bronzes. Aluminum. Various metals and alloys. Welding machines. Cutting of iron and steel. Index.

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**GRAY, A.** Principles and Practice of Electrical Engineering. By Alexander Gray, Whit. Sch., M. Sc., Professor and Head of the Department of Electrical Engineering, Cornell University. Author of "Electrical Machine Design." Second edition, revised and enlarged. 431 p. 8 vo il. 1917. \$4.00

A revision of the standard textbook for those who desire to obtain a broad idea of the principles and practice of electrical engineering without studying the subject in detail. The fundamental principles are emphasized and elaborated gradually to show applications.

**GREEN, ARTHUR G.** The Analysis of Dyestuffs, and Their Identification in Dyed and Colored Materials, Lake-Pigments, Foodstuffs, etc. 144 p. 8 vo il. 1915. \$3.75

This book is for those who are concerned with the manufacture or application of dyestuffs. In America the subject is one of tremendous importance. The great progress in the development of the artificial dyestuff industry has brought with it a necessity for systematic methods of analysis capable of being applied not only to dyestuffs in substance, but also to all manner of dyed and colored materials.

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**GREENAWALT, W. E.** The Hydrometallurgy of Copper. By William E. Greenawalt, C.E., B.S. 504 p. 8 vo il. 1912. \$6.00

Part I—Roasting. Part II—Hydrometallurgical processes. Wet methods of treating copper ores are diverse. Information has been fragmentary and widely scattered. Mr. Greenawalt, with the assistance of prominent specialists, made an exhaustive study of the literature. He has, besides, been active in the development of various processes, and gives freely here the results of his research. The book covers processes, methods, apparatus, and compares the various processes.

**GREENE, A. M.** The Elements of Refrigeration. A text book for students, engineers, and warehousemen. By Professor Arthur M. Greene, Jr. 472 p. 8 vo il. 1916. \$4.50

The book brings together in logical order the data from which to design, construct, and operate refrigeration apparatus.

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**GREENE, A. M.** Pumping Machinery. A treatise on the history, design, construction and operation of various forms of pumps. By Professor Arthur M. Greene, Jr. Second edition. 703 p. 8 vo. il. 1919. \$4.50

Comprises an examination and description of the various forms of pumping machinery, together with a treatise on methods of design. **Contents:** Modern forms of pumps. Simplex pumps. Dynamics of water end. Design of parts. Dynamics of steam end. Steam end details. Test of pumping engines. High duty pumps and water works stations. Special pumping machinery. Injector and pulsometer. Airlift pumps and pneumatic pumps. Centrifugal pumps. Mine pumps.

**GREENE, WILLIAM H.** Lessons in Chemistry. Fourth edition thoroughly revised, by Harry F. Keller, Ph.D. 460 p. 12 mo il. 1908. \$1.00

**GREENFIELD, ERIC VIELE.** Introduction to Chemical German. 384 p. 12 mo 1918. \$1.40

**GREGORIUS, R.** Mineral Waxes, Their Preparation and Uses. Translated by C. Salter. 247 p. 12 mo. il. 1908. \$3.00

**Contents:** Ozokerite and ceresine. Paraffin. Mineral (Montan) wax; Various appliances for extracting, distilling, and refining ozokerite, etc.; Uses of ceresine, paraffin and mineral wax.

**GRIFFIN, ROGER CASTLE.** Technical Methods of Analysis. As Employed in the Laboratories of Arthur D. Little, Inc. Edited by the author, who is Director of Analytical Department, Arthur D. Little, Inc. 668 p. 8 vo. 29 il. 1921. \$6.00

**Contents:** Reagents; General inorganic analyses. General organic analyses; Analysis of metals; Analysis of fuels; Analysis of paints and paint materials; Analysis of oils, fats, waxes and soaps; Analysis of wood, paper, and paper-making chemicals. Analysis of textiles and textile fibers; Analysis of foodstuffs; Miscellaneous analyses.

**GRIFFITHS, D.** Methods of Measuring Temperature; with an introduction by E. H. Griffiths. 176 p. 8 vo. 1918. \$2.75

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**GROSSMAN, J.** The Elements of Chemical Engineering. Second edition, revised, with a preface by Sir William Ramsay, K.C.B., F.R.S. 152 p. 12 mo. il. \$8.00

**Contents:** Introduction. The boiler and its technical equivalents. Distilling flasks, Liebig condensers, fractionating tubes, and their technical equivalents. The air bath and its technical equivalents. The bloopipe and the cruchie, and their technical equivalents. The steam boiler and other sources of power. General remarks on the application of heat in chemical engineering. The funnel and its technical equivalents. The mortar and its technical equivalents. Measuring instruments and their technical equivalents. Materials used in chemical engineering, and their mode of application. Technical research and the designing of plant. Conclusion. Current prices of chemicals and materials. Index.

**GROTH, P.** The Optical Properties of Crystals. Translated from the Fourth Revised and Augmented German Edition by B. H. Jackson. 309 p. 8 vo. 121 il. 2 colored plates. 1910. \$3.50

Sets forth the principles governing the effect of the structure of crystals on the propagation, reflection, refraction and polarization of light.

**GROVES, C. E., and THORP, W.** Chemical Technology. The Application of Chemistry to the Arts and Manufactures. Edited by Charles F. Groves, F.R.S., and Wm. Thorp, B.Sc., F.I.C. Each volume sold separately.

Volume I. Fuel and Its Applications. By E. J. Mills, F.R.S., and F. I. Rowan, C.E. 8 vo il. 1889. \$6.00

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Enamelling is an industry rapidly developing in the United States. For an exact knowledge of a work's procedure an acquaintance with the chemical mineralogical technology of the raw materials is essential. The author has given us the latest practice and research in as compressed and popular manner as possible.

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**GRUNWALD, JULIUS.** The Technology of Iron Enamelling and Tinning. 136 p. 8 vo. 1915. \$3.00

The chapters contained in this book are the outcome of studies originating in the very restricted leisure time possessed by the director of a large works.

**Contents:** A contribution to the history of the enamel and of their technology. The economic significance of the sheet iron enamelling industry. A contribution to the chemical technology of the enamel industry. Enamel manufacture and the function of clay in the enamel. Point of casting, its theory and technology. The examination of cast iron channels. The softening of enamels when ground moist by means of vehicles. An article dealing with the heating and pickling of the rough iron wares in the enamel industry. Recent investigations on the pickling processes. The calculation of the chemical composition of an enamel from the mixed raw materials. On the technological history of tinning. The recovery of tin from tinned waste. The danger of lead compounds to industry and the household. On tin disease, or tin pest. The procedure in an enamel works. The educational training of managers for enamel works and the necessity of technical schools for the German and Austro-Hungarian enamel industry.

**GRUNWALD, JULIUS.** The Theory and Practice of Enamelling on Iron and Steel. Translated by Herbert H. Hodgson, M.A., B.Sc., Ph.D. With historical notes on the use of enamel. 131 p. 8 vo. 1910. \$3.00

This treatise is from the pen of a German technologist of wide experience in enamel works, and who is now the chief chemist and director of large works in the French centre of the industry.

**Contents:** Introduction. The raw materials. Preparation of the enamel. Preparation of the crude ware. The process of enamelling. Firing the enamelled wares. The decoration of enamelled objects—painting. Decoration of enamelled objects—photo ceramics. Statistics and general information. Appendix: Short history of the art of enamelling. Index.

**GUEST, J. J.** Grinding Machinery. 444 p. 8 vo. il. 1915. \$5.75

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**GUILLIERMOND, ALEXANDRE.** The Yeasts. Translated and thoroughly revised in collaboration with the original author. By Fred Wilbur Tanner. 424 p. 8 vo. 163 il. 1920. \$6.00

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**GUTHRIE, E. SEWALL.** *The Book of Butter; a text on the nature, manufacture and marketing of the product.* (Rural text book ser.) 270 p. 12 mo. il. 1918. \$1.75

Index. Author is professor of dairy industry, New York State College of Agriculture, Cornell University.

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**HAAS, PAUL, and HILL, T. A.** *An Introduction to the Chemistry of Plant Products.* (In two volumes. Vol. I—On the Nature and Significance of the Commoner Organic Compounds of Plants.) Vol. II in preparation. Third edition. 427 p. 8 vo. 1921. \$5.50

**CONTENTS:** Fats, oils and waxes; Phosphatides; Aldehydes, Carbohydrates, Glucosides, Tannins, Pigments, Nitrogen bases, The colloidal state, Proteins, Enzymes

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**HALE, ARTHUR J.** *The Manufacture of Chemicals by Electrolysis.* 8vo. 1920. \$2.00

**HALE, ARTHUR J.** *Synthetic Use of Metals in Organic Chemistry.* 169 p. 12 mo. 1914. \$1.50

**HALE, WILLIAM J.** *The Calculations of General Chemistry with Definitions, Explanations, and Problems.* Second Edition, Revised. 275 p. 12 mo. 1909. \$1.50

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**CONTENTS:** Introductory. Fertilizers containing nitrogen. The function and comparative value of nitrogenous manures. Phosphatic manures. The function and use of phosphatic fertilizers. The potassic fertilizers. Farmyard manure, Peruvian guano and other mixed fertilizers. Materials of indirect fertilizing value. Theories of fertilizer action. Systems of manuring crops; The valuation and purchase of fertilizers; The conduct of experiments with fertilizers

**HALL, A. D.** *The Soil: An Introduction to the Scientific Study of the Growth of Crops.* 352 p. il. Third edition, revised and enlarged. 1920. \$2.00

**CONTENTS:** Introductory. The Origin of soils; The mechanical analysis of soils; The texture of the soil; Tillage and the movements of soil water. The temperature of the soil; Chemical analysis of soils; The living organisms of the soil; The power of the soil to absorb salts; Causes of fertility and sterility of soils; Soil types; Appendixes; Index

**HALL, C. H.** *Chemistry of Paints and Paint Vehicles.* 140 p. 12 mo. il. 1906. \$2.00

**CONTENTS:** Determination of the Elementary Constituents of Paints, Raw Materials; Properties, Tests and Methods of Analysis. Analysis of Dry Colors, Pastes and Liquid Paints; Matching of Samples; Paint Vehicles. Oils, Varnishes, Japans and Driers, Thinners.

The author has attempted to lift from the great mass of analytical chemistry those methods which apply particularly to the analysis of paints, at the same time calling attention to the most important physical characteristics of the raw materials. This book, being written from the standpoint of a chemist, employed in the manufacture of paints and colors, the chapter on Matching Samples has been included in an attempt to bridge the space between the laboratory and the factory. It is here that so often the results of previous analysis are rendered worthless by being placed in the hands of one who does not understand their interpretation nor the composition of the raw materials which he is using.

**HALL, J. H.** *The Steel Foundry.* By John Howe Hall, Consulting Engineer. 271 p. 8 vo. il. 1914. \$3.50

It aims to give the characteristics of steel castings from a manufacturing point of view, the details of the various steel manufacturing processes and their characteristics as applied to the different types of castings, including relative cost of installation, relative cost and quality of steel produced, etc.; foundry procedure, such as moulding, pouring, annealing, etc.

**CONTENTS:** I—Introductory. II—General considerations governing the choice of a method of steel making. III—The crucible process. IV—The Bessemer process. V—The open hearth process. VI—The electric furnace. VII—Summary; special deoxidizers, ladles. VIII—Moulding. Pouring and digging out. IX—Heat treatment and annealing. X—Finishing, straightening and welding. XI—Laboratories. XII—Building up impurities in steel.

**HALLIGAN, JAMES EDWARD.** *Fertility and Fertilizer Hints.* 155 p. 8 vo. il. 1911. \$1.50

**CONTENTS:** Chemical elements needed by plants, and the composition of plants. The fertility of the soil. Maintaining soil fertility. Farm manures. High grade nitrogenous materials. Low grade nitrogenous materials and functions of nitrogen. Phosphates. Superphosphates and effect of phosphoric acid; Potash fertilizers. Miscellaneous fertilizer materials; Lime, gypsum and green manures. Commercial fertilizers; Valuation of fertilizers; Home mixtures. A few remarks about fertilizers.

**HALLIGAN, J. E.** *Soil Fertility and Fertilizers.* By James Edward Halligan, Chemist in Charge, Louisiana State Experiment Station, Baton Rouge, La. 398 p. 8 vo. il. 1912. \$4.00

**CONTENTS:** Chapter I—Chemical elements needed by plants and the composition of plants. Chapter II—The fertility of the soil. Chapter III—Maintaining soil fertility. Chapter IV—Farm manures. Chapter V—High grade nitrogenous materials. Chapter VI—Low grade nitrogenous materials and functions of nitrogen. Chapter VII—Phosphates. Chapter VIII—Superphosphates and effect of phosphoric acid. Chapter IX—Potash fertilizers. Chapter X—Miscellaneous fertilizer materials. Chapter XI—Lime, gypsum and green manures. Chapter XII—Commercial fertilizers. Chapter XIII—Valuation of fertilizers. Chapter XIV—High, medium and low grade fertilizers. Chapter XV—Home mixtures. Chapter XVI—A few remarks about fertilizers. Chapter XVII—Fertilizer formulas for crops. Appendix—The agricultural experiment stations. How to collect an exhibit of fertilizer materials. Fertilizer constituents in feed stuffs

**HALSE, EDWARD.** *A Dictionary of Spanish and Spanish-American Mining, Metallurgical, and Allied Terms.* Second edition. 380 p. 12 mo. il. 1914. \$4.00

The book is much more comprehensive than its title indicates. It gives a vocabulary of technical mining engineering terms used in Mexico, Columbia, other parts of Latin America, and Spain. The dictionary contains many words in common use in or around mines, however slight may be their connection with the technical side of the language. French and Portuguese, and even German equivalents, are introduced wherever possible, and words are often traced to their original meaning. This book is indispensable to those who enter Latin America with the serious intention of prospering through the mineral riches of those countries

**HALSEY, F. A.** *The Use of the Slide Rule.* Fourth edition, revised and enlarged. 96 p. 16 mo. il. 1915. \$0.75

**CONTENTS:** Principle of the slide rule; Mechanical addition; Multiplication; Multiplication of mixed numbers; Finding the decimal point; Division; Multiplying by vulgar fractions; The runner. Reducing vulgar fractions to decimals; Squares and square roots; Areas of circles; Slide rule formulas; Gage points. The inverted slide; The circular slide rule; Extended scale instruments. Special slide rules. Some special forms of computers; Calculating cone pulleys and back gearing ratios.

**HAMILTON, DOUGLAS T., and OBERG, ERIK VALDEMAR.** *Electric Welding; a comprehensive treatise on the practice of the various resistance and arc welding processes, covering descriptions of the machines and apparatus used and the applications both in manufacturing and repair work.* 294 p. 8 vo. il. 1918. \$2.50

**HAMILTON, DOUGLAS T.** *Gages, Gaging and Inspection.* 295 p. 8 vo. il. 1918. \$2.50

**HAMILTON, E. M.** *Manual of Cyanidation.* 260 p. Pocket size, flexible. il. 1920. \$3.00

**CONTENTS:** I—Notes on the Chemistry of the Process. II—Testing and Analysis of Solutions. III—Sand Leaching. IV—Shine Treatment. V—Milling in Cyanide Solution. VI—VII—VIII—Discrepancies Between Actual Recovery and Theoretical Extraction. IX—Ores Presenting Special Difficulties. X—Precipitation. XI—Cleaning up and Melting. XII—Laboratory Experiments. XIII—Cost Sheets and Plant Data. XIV—Tables.

**HAMILTON, H.** *Scientific Treatise on Smoke Abatement.* 155 p. 8 vo. il. 1917. \$2.00

This comprehensive, well illustrated work, although anticipating the requirements of the sanitary engineer and smoke inspector, is also admirably adapted to the needs of the works manager and the general reader.

Reviewed in *Iron & coal trade review*, Aug. 31, 1917; *Practical engineer* (London), Aug. 30, 1917; *Chemical trade journal*, Aug. 11, 1917.



**HARVEY, ARTHUR.** Practical Leather Chemistry. A Handbook of Laboratory Notes and Methods for the Use of Students and Works Chemists. 210 p. il. 1920. \$6.00

CONTENTS: Water analysis; Analysis of lime; Analysis of sodium and arsenic sulphides; Estimation of nitrogen; Analysis of lime liquors; Analysis of lime pelt; Analysis of lactic acid; Other deliming agents; Single bath chrome liquors; Two bath chrome tanning; Commercial egg yolk; Soap analysis; Oils, fats and waxes; The tannins (qualitative); The tannins (quantitative); Tan liquors; Leather analysis; Finishing materials; Natural dyestuffs; Coal tar dyes. Appendix Index

**HASKELL, ALLAN C.** How to Make and Use Graphic Charts. 539 p. 8 vo. il. 1919. \$5.00

**HASKINS, HOWARD D.** Organic Chemistry. Third edition, revised. 472 p. 8 vo. 25 il. 1917. \$3.00

The work presents in the simplest manner the facts of organic and physical chemistry which bear essentially on medical science, for medical students. Numerous practical exercises accompany the text.

**HASSACK, PAUL.** Vinegar Bulletin. The manufacture of fermented vinegar. A complete illustrated encyclopedia covering all phases in the manufacture of spirit, cider, malt and grape vinegar. 250 p. 4 to il. 1918. \$18.75

CONTENTS: Theoretical versus practical yield in the oxidation of alcohol into acetic acid by fermentation; A modern automatic device for vinegar generation of large diameter; Melon vinegar; The manufacture of malt vinegar; The utilization of the apple; Acid resisting material important in the manufacture of cider, wine, vinegar, the canning, preserving and chemical industries; The manufacture of spirit vinegar; Wine of grape vinegar; Natural fermented syrup and molasses vinegar; Vinegar specialties; Conclusion.

**HATFIELD, W. H.** Cast Iron in the Light of Recent Research. 249 p. 8 vo. il. 1912. \$4.00

This work is the result of the author's own investigations in this field and embodies many years' practical experience. It presents in a single volume results of many researches on the nature and properties of cast and malleable cast iron and the scientific principles underlying their manufacture.

CONTENTS: Introduction. The iron-carbon alloys and cast iron from the standpoint of the equilibrium diagram. The influence of silicon. The influence of phosphorus. The influence of sulphur. The influence of manganese. The influence of other elements upon the properties of cast iron. Influence of casting temperature shrinkage and contraction in cast iron. The growth of cast irons during repeated heatings. The effect of superheated steam upon cast iron fittings, etc. Malleable cast iron. The heat treatment of cast iron. The decarburization of cast iron without further fusion. The mechanical properties of cast and malleable cast iron. Furnaces and slags. Appendices. Index.

**HATSCHEK, EMIL.** Introduction to the Physics and Chemistry of Colloids. Third edition. 107 p. 12 mo. 1910. \$1.50

**HATSCHEK, EMIL.** Laboratory Manual of Elementary Colloid Chemistry. 135 p. 8 vo. 1920. \$2.00

**HATT, WM. K., and SCOFIELD, H. H.** Laboratory Manual of Testing Materials. New second edition. 176 p. 8 vo. il. 1920. \$2.00

A thorough revision of this widely used manual. The methods of tests, specifications and related data have been brought strictly up to date. This has been especially necessary in the field of concrete, where developments in recent years have been so rapid.

CONTENTS: I General. II General instructions. III Definitions. IV. Materials stressed beyond the elastic limit. V Testing and testing-machines. VI List of experiments. VII Instructions for performing experiments: 1 Testing machines. 2 Iron and steel. 3 Testing of wood. 4 Tests of cements. 5 Study of aggregates. 6 Proportioning mortars and concretes. 7 Tests of concrete and other brittle materials. 8 Tests of road materials.

**HAUSBRAND, E.** Drying by Means of Air and Steam. With explanations, formulas, and tables for use in practice. Translated from the German by A. C. Wright. 77 p. 12 mo. il. 1917. \$2.50

CONTENTS: Comparison between English and metric systems and the Centigrade and Fahrenheit thermometers. Tables and calculations; Drying apparatus; Drying by superheated steam; Heating surface; Velocity of air current; Dimensions of drying room; Surface of the drying material; Losses of heat.

**HAUSBRAND, E.** Evaporating, Condensing and Cooling Apparatus. Explanation, formulas and tables for use in practice. Translated from the Second Revised German Edition by A. C. Wright. 26 il. 76 tables. 400 p. 8 vo. 1919. \$6.00

CONTENTS: The coefficient of transmission of heat, and the mean temperature difference; Parallel and opposite currents; Apparatus for heating with direct fire; Injection of saturated steam; Superheated steam; Evaporation by means of hot liquids; Transference of heat; Evaporation in a vacuum; Multiple-effect evaporator; Weight of water which must be evaporated from 100 kilos of liquor in order to bring its original percentage of solids from 1.25 per cent up to 20.70 per cent; Relative proportion of the heating surfaces in the elements of the multiple evaporator and their real dimensions; Pressure exerted by currents of steam and air upon floating drops of water; Motion of floating drops of water; Splashing of evaporating liquids; The diameter of pipes for steam, alcohol vapor and air; Diameter of water pipes; Loss of heat from apparatus and pipes; Condensers; Heating liquids by steam; Cooling of liquids; The volumes to be exhausted from condensers; Air pumps and the vacua they produce; Volumetric efficiency of air-pumps; The volumes of air which must be exhausted from a vessel in order to reduce its original pressure to a certain lower pressure; Tables.

**HAUSNER, A.** Manufacture of Preserved Food and Sweetmeats. A handbook of all the processes for the preservation of flesh, fruit, and vegetables, and for the preparation of dried fruit, dried vegetables, marmalades, fruit-syrups, and fermented beverages, and of all kinds of candies, candied fruit, sweetmeats, rocks, drops, dragees, pralines, etc. Translated from the Third Enlarged German Edition by Arthur Morris and Herbert Robson, B.Sc. 231 p. 12 mo. il. 1912. \$3.50

CONTENTS: Causes of Putrefaction of Food; Composition of Food; Decomposition; Various Methods of Preserving; Meats; Eggs; Milk;

Fat; Vegetable Foods; Fruits; Manufacture of Jam and Jellies; Manufacture of Candied Fruit; Caramelized Fruit; Bonbon Making; Fruit Drops; Machinery and Appliances for Candy-making; Oils in Candy-making; Recipes, etc.

**HAVARD, F. T.** Refractories and Furnaces. Properties, preparation and application. By F. T. Havard, E.M., late Associate Professor of Metallurgy, University of Wisconsin. 380 p. 8 vo. il. 1912. \$5.00

A comprehensive study of the physical and chemical properties of materials used in the construction of industrial furnaces. CONTENTS: Notes on the history and development of the fire clay and refractories industry. I.—Classification of refractory materials. II.—The relation between slags and refractory vessels and linings. III.—The preparation of the silicious refractories. IV.—The preparation of the refractory clays. V.—The preparation of the basic and neutral refractories. VI.—The use of refractory materials in the metallurgy of iron and steel. VII.—Refractories used in the metallurgy of copper. VIII.—Refractories used in the metallurgy of lead and silver and in general metallurgical practice. IX.—Refractories used in the chemical and electro-metallurgical industries. X.—Some instances of application of common and refractory bricks in industrial furnaces. XI.—Directions in constructing furnaces. XII.—Refractory hollow ware. XIII.—Testing of refractory products and refractory raw materials. XIV.—The thermo-physical properties of furnace materials. XV.—Heat measurements in the metallurgical and refractories industry. XVI.—The preparation of common brick.

**HAWAIIAN CHEMISTS' ASSOCIATION.** Methods of Chemical Control in Cane Sugar Factories. 103 p. 8 vo. il. 1916. \$3.00

Describes the latest methods of chemical control as adopted by the Hawaiian sugar factories. The various apparatus used in the control work is fully described and illustrated. A chapter is devoted to the preparation of reagents that are used. Concludes with 16 numerical tables used in the control, many of them especially calculated for the purpose.

**HAWLEY, L. F.** Wood Distillation. American Chemical Society Monograph. In preparation.

**HAYS, J. W.** Combustion and Smokeless Furnaces. 118 p. 8 vo. il. 1915. \$2.00

CONTENTS: Heat and combustion. Combustion and the boiler furnace. Combustion and the steam boiler. The chimney evil. Smokeless furnaces in general; Mechanical stokers; Hand fired furnaces. Some conclusions; Index.

**HEATH, G. L.** The Analysis of Copper. Including the ores and principal alloys. By George L. Heath, Chief Chemist, Calumet & Hecla Smelting Works. 292 p. 8 vo. il. 1916. \$3.00

This volume constitutes the first connected account of the principal methods employed by the largest refineries, foundries, and custom sampling works for the control of operations and valuation of material, following the logical sequence from the ore in the mine to the finished metallic product. The book is intended primarily for the technical chemist and advanced students, but will be of value to all interested in the subject.

**HEERMANN, P.** Dyers' Materials. An introduction to the examination, valuation, and application of the most important substances used in dyeing, printing, bleaching and finishing. Second edition, revised and enlarged by H. B. Stocks. 158 p. 16 mo. il. 1919. \$3.00

CONTENTS: Indicators; Standard solutions and reagents; Water; Textile fibers; Hydrochloric acid and the chlorides, Fluorides and bifluorides; Sulphuric acid and sulphates, Nitric acids and nitrates; Chlorine; Oxygen compounds; Sulphites, Alkalies, Peroxides, Zinc dust; Fatty acids and their salts; Cyanogen compounds; Derivatives of fats; Aniline and aniline salts; Thickening material dyes.

**HEESS, J. K.** Practical Methods for the Iron and Steel Works Chemist. Dr. Heess is Chief Chemist for the Carnegie Steel Company, New Castle, Pa. 60 p. 8 vo. 1918. \$1.25

CONTENTS: Part I.—The laboratory. General information. Miscellaneous notes. Standards. Elements used in this work. Table of factors. Table of molecular formulae and molecular weights. Information to aid in rapid calculations. Standard solutions and reagents. Part II.—Iron ores. Coke and coal. Limestone. Blast furnace slag. Iron Steel Gravimetric method for Mn in ferro-manganese. Gravimetric method for Mn in ores, iron, steel and spiegel. Gravimetric method for phosphorus. Gravimetric method for sulphur in iron and steel. Carbon in iron and steel by combustion. Phosphorus in ores, etc., containing as: Ferro-manganese. Ferro-silicon. Slags and cinders. Fluorspar. Fire stone, fire sand, ganister, mica schist, etc. Fire-brick, fire clay and kaolin. Portland cement. Chromium and tungsten in steel. Analysis of water for boiler purposes. Determination of tallow fat in cylinder oils. Gas analysis: Blast furnace and chimney gases, Producer and coke oven gases. Bearing metals: Alloys containing Sn, Sb, Cu and Pb; Alloys containing Cu, Sn and Zn.

**HEIL, ADOLPH, and ESCH, W.** Manufacture of Rubber Goods. 237 p. 8 vo. 1917. \$4.50

**HELDT, P. M.** The Gasoline Automobile; its design and construction. Vol. I.—The gasoline motor, with a separately bound plate supplement. Vol. II.—Transmission, running gear and control. Vol. III.—Electrical equipment. 3 vol. 8 vo. il. 1916-1919. \$13.50

There has been a large amount of revision. With an entirely new chapter on water cooling systems. Changes have been made in the sections relating to engine balance, aluminum pistons, tubular connecting rods, forked rods for V engines and crankshafts. It is stated that probably the most important addition is that relating to the accurate calculation of the various types of cams. An attempt has been made to give rules and constants of design both for typical pleasure and commercial car engines. Author is technical editor of the *Horseless age*.

**HENDERSON, G. G.** Catalysis in Industrial Chemistry. (Monographs on Industrial Chemistry.) Second edition. 202 p. 8 vo. 1921. \$3.40

CONTENTS: Catalysis and catalysts; Generalities; Autocatalysis; Negative catalysis; Catalyst poisons; Promoters; Preparation of active metals; Hydrogen; Chlorine and chlorine compounds; Graphite; Carbon

tetrachloride and oxychloride; Carbon disulphide; Elimination from coal gas; Sulphur; Sulphuric acid; Sulphuryl chloride; Persulphates; Regeneration of chromic acid; Ammonia; Other compounds of nitrogen; Nitric acid; Hydrogenation; Generalities; Reduction in gaseous systems; Reduction liquid systems; Addition of hydrogen in gaseous systems; Addition of hydrogen liquid systems; Dehydrogenation; Degradation of hydrocarbons; Oxidation in gaseous systems; Oxidation, liquid systems; Hydration and hydrolysis; Dehydration; Polymerization; Condensation; Preparation of hydrocarbons; Preparation of halogen derivatives; Sulphonation and nitration; Preparation of amine derivatives; Diazo compounds; Preparation of aldehydes and ketones; Preparation of sulphur compounds; Intramolecular rearrangement; Fuzines; Surface combustion; List of catalysts; Index of subjects.

**HENDRICK, ELLWOOD.** Everyman's Chemistry. 374 p. 8 vo. il. 1917. \$2.00

A delightfully chatty book, containing much accurate information stated in simple language.

**HENRICH, FERDINAND.** The Theory of Organic Chemistry. Translated and enlarged from the third revised edition by Treat B. Johnson and Dorothy A. Hahn. 8 vo. 1921.

A comprehensive development of the most fundamental conceptions in regard to atomic relationships in the field of organic chemistry, from earliest times to the present.

CONTENTS: The historical development of the theory of organic chemistry up to the period of the theory of types. The early history of structural chemistry. Later developments in structural chemistry. Johannes Thiele's theory of partial valencies. The theory of Alfred Werner; The so-called negative nature of atomic groups of radicals. Recent theories in regard to the mechanism by which molecules interact. Theories in regard to the constitution of benzene. Tautomerism and desmotropism; Ionization; Isomerism. The application of physico-chemical principles to organic chemistry. The theoretical speculations of John Ulric Nef; Conceptions in regard to the independent existence of free organic radicals. The relationship between color and chemical constitution. The theory of indicators. Fluorescence in its relation to the chemical constitution of the molecule. Molecular rearrangements; The basic properties of oxygen; The theoretical speculations of Arthur Michael; Recent electrochemical theories.

**HENRY, THOMAS A.** The Plant Alkaloids. 466 p. 8 vo. 1913. \$5.00

**HENSCHMEN, HANS PETER.** Packing House and Cold Storage Construction; a general reference work on the planning, construction and equipment of modern American meat packing plants, and a complete treatise on the design of cold storage plants, including refrigeration insulation and cost data. 310 p. 8 vo. il. 1916. \$5.00

This much needed work by an architect who has specialized in this kind of construction is practical and complete carefully following the requirements of the United States Bureau of Animal Industry, the approval of which is necessary for the plans of all new packing plants involving government inspection. It is stated that the chapters on cold storage construction "contain information which heretofore has only been available through a close study and investigation of existing buildings or through scattered descriptions and discussions of this subject in current technical journals." The illustrations are carefully done and there are several double page plans.

**HERING, CARL.** Ready Reference Tables. 196 p. 8 vo. 1904. \$2.50

Contains conversion factors of every unit or measure in common use. The information is conveniently arranged for engineers, physicists, students, merchants, etc.

**HERING, CARL, and GETMAN, FREDK. H.** Standard Table of Electrochemical Equivalents and Their Derivatives. With explanatory text on electrochemical calculations, solutions of typical practical examples and introductory notes on electrochemistry. 138 p. 24 mo. il. 1917. \$2.00

CONTENTS: Fundamental Laws; Fundamental Data and Description of the Tables. Table 1. Electrochemical Equivalents by Weight. Table 2. Grams per Ampere hour in the Order of Magnitude. Table 3. Electrochemical Equivalents by Volume. Table 4. Valencies of the Elements in Their Combinations; Calculations Involving Electrochemical Equivalents. Examples; Electrolysis. Theory of Electrolytic Dissociation; Faraday's Laws; Coulometers; The Electron Theory; Appendix Valence; Elementary Principles of Chemical Reaction and Calculations; Conversion Factors Used in Electrochemical Calculations; Glossary of Terms.

**HERING, RUDOLPH, and GREELY, SAMUEL A.** Collection and Disposal of Municipal Refuse. 653 p. il. 8 vo. 1921. \$7.00

A comprehensive survey of the methods of collecting, transporting and delivering the different kinds of refuse to the points of disposal and the various means for their sanitary disposition.

Wherever cost data are given, the years to which they are applicable have been noted.

CONTENTS: Refuse materials. House treatment. Collection. Supplemental transportation. Estimating the cost of collection and transportation. Outline of methods of final disposal. Depositing in water and on land. Feeding garbage to hogs. Sorting rubbish. Incineration of refuse. Reduction of garbage. Estimating costs of final disposal. Selecting the method of disposal. Stable refuse. Street refuse. Night-soil and dead animals. Procedure in small towns and villages.

**HERINGTON, C. F.** Powdered Coal as a Fuel. Second edition, revised and enlarged. 350 p. 8 vo. il. 1920. \$4.50

"Raw coal cannot be compared with powdered coal with respect to efficiency of combustion. With proper appliances and methods, the last produces almost smokeless fire with a steady intense heat and maximum furnace temperature." This work by an assistant engineer of the New York Central Railroad describes various patents, designs, and systems, as well as their applications to the cement industry, reverberatory furnaces, metallurgical furnaces, boilers and locomotives. There is a chapter on explosion risks, also a 12-page list of references.

CONTENTS: Introduction; Coals suitable for powdering; Preparation of powdered coal; Feeding and burning powdered coal; Powdered coal in the cement industry; Application of powdered coal to reverberatory furnaces; Powdered coal in metallurgical furnaces; Powdered coal under boilers; Powdered coal for locomotives; Explosions; Effective use of

powdered coal in metallurgical furnaces; Recent utilization of powdered coal in boilers; Tables and useful data; How to operate a pulverized-coal plant; Bibliography.

**HERIOT, T. H. P.** Manufacture of Sugar from the Cane and Beet. (Monographs on Industrial Chemistry.) 426 p. 8 vo. 1920. \$6.50

CONTENTS: The raw materials. Extraction of juice from the cane; Extraction of sugar from the beet. Composition of cane and beet juices. Treatment of cane and beet juices. Evaporation of water from the juice. Crystallization. Special methods of extracting sugar from molasses. Refining of cane and beet sugars.

**HIBBARD, HENRY D.** Manufacture and Uses of Alloy Steels. 96 p. 8 vo. 1919. \$1.50

CONTENTS: Definitions. Acknowledgment. Introduction. List of useful alloy steels. Alloy treated steels. Structural alloy steels. Simple tungsten steel. Simple chromium steel. Manganese steel. Simple nickel steel. Nickel-chromium steels. Silicon steels. High speed tool steels. Chromium-vanadium steels.

**HICKS, JAS. A.** The Laboratory Book of Mineral Oil Testing. Third edition, with introduction by Sir Florentin Redwood. 76 p. 12 mo. il. 1918. \$1.50

CONTENTS: Preliminary. Specific gravity. Flashing point. Viscosity. Color. Sundry apparatus. Appendix. Index.

**HIGGINS, SYDNEY H.** The Dyeing Industry. 189 p. 8 vo. 1919. \$3.40

**HILDEBRAND, J. H.** Principles of Chemistry. 313 p. 12 mo. 1918. \$2.25

**HILDITCH, T. P.** Concise History of Chemistry. 273 p. 12 mo. 1911. \$1.50

**HILL, ARTHUR E.** A Brief Laboratory Guide for Qualitative Analysis. Third edition, revised and enlarged. 104 p. Small 12 mo. 1915. \$1.25

CONTENTS: Outline of the scheme. Systematic analysis. Analysis for the metallic radicals. Analysis for the acid radicals. Study of chemical reactions. Metals. Acid radicals. Review questions. Model reports. Concentration of reagents. Dry reagents.

**HINCHLEY, J. W.** Chemical Engineering; notes on grinding, sifting, separating, and transporting solids. 103 p. 12 mo. il. 1914. \$3.00

CONTENTS: Size reduction of solid material. Sifting. Size separation by fluid media; Separation of solids by magnetic methods; Mixing; Transport of solid material.

**HIND, H. LLOYD, and PANDLES, W. B.** Handbook of Photomicrography. 292 p. 8 vo. 1914. \$2.50

**HIND, R. RENTON.** Heat Conservation in Sugar Factories. 149 p. 8 vo. il. 1917. \$2.00

The experience of the author as engineer in cane sugar factories for over eight years pointed out to him the need of a concise reference work on the subject of heat losses, and this volume has been compiled to aid the sugar house engineer in all departments of the cane sugar factory in which steam is used, including the crushing plant, boiler room and boiling house. The object of the book is to show means of remedying adverse conditions throughout the factory.

**HINDS, J. I. D.** Qualitative Chemical Analysis From the Standpoint of Solubilities, Ionization and Mass Action. Second edition. 266 p. 8 vo. 1913. \$2.50

CONTENTS: Principles and methods of qualitative analysis; Introductory. Method of analysis. Separation. Solutions. Reactions. Basic analysis. Silver group; Copper-arsenic group; Iron group; Zinc group; Barium group; Magnesium-alkali group; Acidic analysis. Properties and reactions of the non-metals. Acids and anions. Separation and identification of the acids and anions. Complete analysis of an unknown; Reagents and Tables.

**HIORNS, A. H.** Iron and Steel Manufacture. A Text-book for Beginners. By Arthur H. Hiorns. London. Fourth edition, completely revised and enlarged. 211 p. 12 mo. 1907. \$1.20

Presents the fundamental principles of the various processes employed in the manufacture of iron and steel in an elementary manner. Valuable in preparing the beginner for more advanced study.

**HIORNS, A. H.** Metal-Coloring and Bronzing. By Arthur H. Hiorns, Head of the Metallurgical Department, Birmingham Municipal Technical School. London. Second edition. 340 p. 12 mo. 1907. \$2.40

Brings together in convenient form information from various sources on the subject of metal coloring whether produced by chemical, electrochemical or mechanical processes. Many recipes old and new have been thoroughly tested and the results recorded. A brief account has been included of the properties of the ordinary metals and their chemical relations with regard to such elements as oxygen, sulphur, chlorine, etc. Part I.—Chemical effects of the atmosphere, chemical principles and changes, nature and object of metal coloring. II.—Cleaning, dipping, scratch brushing, etc. III.—Chemical metal coloring; IV.—Electrochemical metal coloring and deposition of metals; V.—Electromechanical metal coloring.

**HIORNS, A. H.** Metallography: An Introduction to the Study of the Structure of Metals, Chiefly by the Aid of the Microscope. By Arthur H. Hiorns. 158 p. 12 mo. 1902. \$2.80

Illustrates the principles of the subject by a series of original photographs which help to give an idea of the delicate structure of metals as seen through the microscope. Most of the photographs give an amplification of from 120 to 220 diameters. The book gives an account of the history and development of metallography, the nature of alloys; the polishing and preparing of specimens, etching, oxidizing and coloring as aids to structure revelations. It includes a concise description of a suitable microscope with appliances for illuminating the sections, and directions for photographing the specimens.

**HIORNS, A. H. Mixed Metals, or Metallic Alloys.** By Arthur H. Hiorns. Second edition, completely revised and enlarged. 445 p. 12 mo. 1912. \$2.50

**HIORNS, A. H. Practical Metallurgy and Assaying.** A textbook for the use of teachers, students and assayers. By Arthur H. Hiorns, Head of the Metallurgy Department, Birmingham Municipal Technical School. London. 490 p. 12 mo. 1906. \$2.00

Teaches the principles of metallurgy by means of experiments. Special attention has been given to the analysis of iron and steel. A few elementary experiments have been introduced illustrative of the processes of electro-metallurgy, and a short description has been given of a metallurgical laboratory with its necessary fittings and appliances.

**HIORNS, A. H. Principles of Metallurgy.** By Arthur H. Hiorns. 388 p. 12 mo. 1914. \$2.50

Presents a more extended view of the principles of metallurgy than is contained in the author's *Elementary Metallurgy*. It gives in a simple and succinct form the views of modern metallurgists, and the methods of extracting various metals from their ores. It deals in order with the physical properties of metals, the chemical principles involved in the processes, different kinds of fuel, metallurgy of iron and steel, silver, gold and other metals.

**HIORNS, A. H. Steel and Iron, for Advanced Students.** By Arthur H. Hiorns. 514 p. 12 mo. 1903. \$3.40

A textbook dealing with the more scientific aspects of the iron and steel industries. Although the book deals mainly with general principles, an endeavor has been made to make these as concrete as possible. The subtitle "for advanced students" is not intended to convey the idea that the book is of a highly advanced character, but that it is designed for the students pursuing a second or third year's course in a college or technical school.

**HIORNS, A. H. A Text-Book of Elementary Metallurgy for the Use of Students.** By Arthur H. Hiorns. London. Second edition, completely revised. 212 p. 12 mo. 1906. \$1.40

An elementary treatise on metallurgy adapted to the capacity of a beginner and dealing rather with principles than with detailed processes.

**HISCOX, GARDNER D., ed. Henley's Twentieth Century Book of Recipes, Formulas and Processes.** 808 p. 8 vo. 1920. \$4.00

Among the recipes given are: Bleaching recipes, Etching and engraving recipes; Recipes for glass making; Paper making recipes; Recipes for ornaments; Mirror making formulas; Paint making formulas; Gilding recipes; Galvanizing recipes; Bronzing recipes, Tinning recipes; Silvering recipes; Recipes for adhesives; Recipes for plating and enameling; Cleaning processes; Soap making; Leather and its preparation; Recipes for alloys; Recipes for solders; Photographic formulas; Shoe dressing recipes; Stove blacking recipes; Rust preventive recipes; Recipes for lubricants; Recipes for oils; Recipes for dyes, colors, and pigments; Recipes for dyes; Ink recipes; Recipes for artificial gem making; Jewelers' and watchmakers' recipes; Household formulas; Waterproofing recipes; Fireproofing recipes; Recipes for cements, glues, mastic, Fireworks recipes; Recipes for eradicators; Alcohol and its uses; Recipes for essences and extracts; Dentifrice recipes; Cosmetic recipes; Perfume recipes; Tanning recipes; Metallurgical formulas; Hair restorers; Depilatories.

**HISS, A. EMIL, and EBERT, ALBERT E. The New Standard Formulary.** 1256 p. 8 vo. 1915. \$5.00

**HODGEN, JOSEPH D. Practical Dental Metallurgy.** 436 p. 8 vo. 1918. \$2.50

**HODGSON, JAMES T. Modern Boiler Room Practice and Smoke Abatement.** 321 p. 8 vo. il. 1915. \$1.00

A profusely illustrated work describing in simple language the various means and accessories for obtaining maximum power at a minimum cost. Has chapters on coal and combustion, firing methods, boiler construction, water supply and purification, saturated steam, piping, coal testing, and instruction for attendants. Chapters 19 and 20 give practical questions and answers.

**HOFF, J. N. Paint and Varnish Facts and Formulas.** A handbook for the maker, dealer, and user of paints and varnishes. Containing over 600 recipes. 179 p. 8 vo. \$2.00

**CONTENTS:** White Paints and Pigments; The Oxides of Iron; The Chemical Colors; Classification of Pigments; Colors in Oil, Japan and Water; Oils and Solvents; Varnishes, Ready Mixed Paints; Kalsomines; Paint and Varnish Troubles and Their Remedies; Painting and Decorating; Formulas

**HOFMAN, H. O. General Metallurgy.** By H. O. Hofman. E.M., Met.E., Ph.D., Professor of Metallurgy, Massachusetts Institute of Technology. 909 p. 8 vo. il. 1918. \$7.00

A monumental work aiming to cover the field of General Metallurgy as a whole. The good of the older endeavor has been combined with that of modern research, and the whole has been treated from the point of view of the metallurgist who has a leaning toward physical chemistry. Mechanical processes have received more consideration than has been customary, as the tendency of present metallurgical practice is in this direction.

**HOFMAN, H. O. Metallurgy of Copper.** 556 p. 8 vo. il. 1918. \$6.00

It presents first the leading physical and chemical facts about the metal, its alloys and its compounds, and second details of operation throughout the world. Professor Hofman visited the leading smelters and refineries of the United States, where he was supplied with every facility for securing the latest data. He collected the scattered literature of the subject, to which he makes copious references, and from all parts of the world received the latest information from the leading plants.

**CONTENTS:** I.—Introduction II.—Properties of copper. III.—Copper of commerce, its impurities and their effects. IV.—Industrial alloys V.—Copper compounds. VI.—Copper ores, their metallurgical treatment. VII.—Smelting of copper. A.—Smelting copper sulphide ore; 1. Roasting. 2. Smelting in the blast furnace. 3. Smelting in the reverberatory furnace. 4. Smelting in the converter. 5. The sulphide smelting plant. B.—Smelting oxide copper ores. C.—Smelting native copper ore. D.—Fire-refining of impure copper. VIII.—Leaching of copper: A.—Leaching of copper ores. B.—Leaching copper matte. C.—Leaching metallic copper. IX.—Electrolysis of copper: A.—Multiple system. B.—Series system. C.—Multiple versus series system.

**HOFMAN, H. O. The Metallurgy of Lead and the Desilverization of Base Bullion.** By H. O. Hofman, Professor of Metallurgy, Massachusetts Institute of Technology. 551 p. 8 vo. il. 1918. \$7.00

This standard book has been through many editions and remains to-day the most authoritative work on the metallurgy of lead.

**CONTENTS:** Part I.—Introduction. Historical and statistical notes. Properties of lead and some of its compounds. Lead ore. Distribution of lead ores. Receiving, sampling and purchasing of ores. Flues and fuel. Part II.—Metallurgical treatment of lead ore. Smelting in the reverberatory furnace. Smelting in the ore furnace. Smelting in the blast furnace. Part III.—Desilverization of base bullion. Pattinson process. Parker process. Cupellation process.

**HOFMANN, O. Hydrometallurgy of Silver.** By Ottokar Hofmann. 345 p. 8 vo. il. 1907. \$4.00

Part I.—Chloridizing roasting of silver ores. Chapter I.—Theory of chloridizing roasting. II.—Crushing of the ore. III.—Percentage of salt required. IV.—Loss of silver by volatilization. V.—Methods of roasting. VI.—Consumption of fuel. VII.—Reverberatory furnaces worked by hand. VIII.—Mechanical roasting furnaces. IX.—Collecting the flue dust. X.—Sulphating roasting. XI.—Chloridizing of argentiferous zinc-lead ore. XII.—Chloridizing of calcareous ores. Part II.—Extraction of the silver. XIII.—Lixivation of the sodium sulphophite. XIV.—Precipitation of silver. XV.—Treatment of the precipitate. XVI.—Construction of troughs. XVII.—Trough lixiviation. XVIII.—The Russell and Kiss processes. XIX.—The Augustin process. XX.—Extraction with sulphuric acid. XXI.—The Ziervogel process. XXII.—Treatment of silver ores rich in gold.

**HOLDE, D. The Examination of Hydrocarbon Oils and of Saponified Fats and Waxes.** By Doctor D. Holde. Authorized translation from the fourth German edition, by Edward Mueller, Ph.D., Assistant Professor of Inorganic Chemistry, Massachusetts Institute of Technology. 483 p. 8 vo. il. 1915. \$5.00

This book is a complete discussion of the occurrence, treatment, physical and chemical examination and uses of petroleum and petroleum products, lubricants, natural asphalt, ozokerite, tars from bituminous materials, together with saponifiable fats and technical products.

**CONTENTS:** Petroleum and petroleum products. Naphtha, kerosene, gas oils, motor and fuel oils, lubricating oils. Asphalt. Ozokerite and montan wax. Distillation products of coal, tar, etc. Saponifiable fats (animal and vegetable fats and oils). Products of the fat industry. Waxes.

**HOLE, W. The Distribution of Gas.** Third edition, 865 p. 8 vo. il. 1912. \$8.50

A complete and comprehensive treatise embodying all that is required as an outfit on the subject of distribution, not only to students, but also to managers of gas works. This new edition has been much enlarged and brought up to date by the addition of much new matter and the careful compression of the old material.

**CONTENTS:** Rights and duties of gas undertakings; Preliminary considerations; Discharges from pipes; Discharges from pipes under high pressure; Station governors; Districting; District governors; Cast iron pipes and irregulars; Steel pipes and connections; Joints and jointing; Man-laying; Valves and main cocks; Subways; Service; Wet dry, prepayment, and fixing meters; Pipes and joints for internal fitting; Internal fitting and lighting; Gas fires and cookers; Gas engines; Pressure gauges and registers; Complaints and repairs; Gas as an aid to ventilation; Public lighting; Low pressure self-intensifying and high pressure systems; Lighting and extinguishing lamps; High-pressure distribution and transmission; Compressors; High pressure; Distributing apparatus; Internal lighting and heating; Unaccounted-for gas; Fusion and electrolysis; Appendix.

**HOLLEMAN, A. F.; WALKER, A. JAMIESON, and MOTT, OWEN E. A Textbook of Organic Chemistry.** Fifth English edition, completely revised. 642 p. 8 vo. il. 1920. \$3.50

**CONTENTS:** Qualitative and quantitative analysis; Determination of molecular weight. The element carbon. Laboratory methods; Classification of organic compounds; Aliphatic compounds; Saturated hydrocarbons. Alcohols, Alkyl halides, Esters and ethers; Alkyl radicals linked to sulphur, Alkyl radicals linked to nitrogen; Alkyl radicals linked to other elements. Nitriles and isonitriles. Derivatives of the fatty acids obtained by modifying the carboxyl group; Aldehydes and ketones. Unsaturated hydrocarbons. Substitution-products of the unsaturated hydrocarbons; Monobasic unsaturated acids, Unsaturated aldehydes and ketones. Compounds containing more than one substituent; Polybasic acids; Substituted acids; Aldehydes and ketones; Halogen-substituted aldehydes and ketones; Aldehyde-alcohols and keto-alcohols or carbohydrates. Dienes, Amino-aldehydes and amino ketones; Aldehyde-acid and ketone acids, Amino acids; Proteins; Cyanogen derivatives; Derivatives of carbonic acid, Uric acid group; Cyclic compounds; Alicyclic compounds, Aromatic compounds. Constitution of Benzene, Properties characteristic of the aromatic compounds; Benzene and the aromatic hydrocarbons with saturated side-chains. Monosubstitution products of the aromatic hydrocarbons; Benzene homologues with substituted side chains. Compounds containing an unsaturated side-chain; Polysubstituted benzene derivatives; Orientation of aromatic compounds; Hydrocycle or hydroaromatic compounds; Benzene-nuclei linked together directly or indirectly by carbon; Condensed benzene-nuclei; Nuclei containing nitrogen, Oxygen and sulphur; Condensation-products of benzene and heterocyclic nuclei; Alkaloids.

**HOLLEY, C. D. Analysis of Paint and Varnish Products.** 292 p. 8 vo. il. 1912. \$3.50

**CONTENTS:** Separation of vehicle from pigment. Estimation of water in paints. Water emulsions. Estimation of and determination of purity of linseed oil. Analysis of the volatile oils. Turpentine thinners and substitutes. Inert pigments. White lead and zinc pigments. Determination of fineness, covering power and tinting strength of pigments. Testing-out of paints. Analysis of white paints. Kal somine, cold water paints and flat wall finishes. Composition and analysis of colored paints. Fillers. Shingle stain, barn and roof paints. Japans and driers. Shellac. Spirit and oil varnishes. Enamels.

**HOLLEY, CLIFFORD DYER. Analysis of Paint Vehicles Japans and Varnishes.** 203 p. 8 vo. il. 1920. \$2.50

The methods of analysis are essentially those used by the author in his laboratory work, many of them the result of extended investigation by him and his associates. The book should be of material aid to all engaged in the manufacture and examination of paint, enamel and varnish products.



**CONTENTS:** Examination of petroleum thinners; Examination of turpentine; Alcohols and acetones; Benzol and solvent naphthas; Lined oil; Tung oil (Chinese wood oil); Miscellaneous paint and varnish oil; Separation of vehicle from pigment; Estimation of water in paints; Water emulsions and emulsifiers; Determination of volatile thinner; Examination of extracted oil; Effect of storage on the composition of paints; Analysis of solid and liquid driers; Comparative analysis of black baking japans; Analysis of shellac and lacquers; Analysis of varnish and enamel liquids. Aldenda Index.

**HOOD, CHRISTOPHER.** Iron and Steel: Their Production and Manufacture. (Pitman's Common Commodities and Industries.) 150 p. 12 mo. il. 1919. \$1.00

**CONTENTS:** Iron ores, Coke and limestone. The history of iron making; Origins and progress. The history of modern steel processes. The Bessemer process. The Siemens-Martin open-hearth process. The electric furnace. The processes and plant used in iron and steel making. The blast furnace and its accessories. Steel furnaces and processes. The acid open-hearth; Foundry iron. The history of the trade in iron. The iron trade in various countries. The warrant market. Protective policies and combinations of manufacturers.

**HOOL, G. Alb., and others.** Concrete Engineers' Handbook, data for the design and construction of plain and reinforced concrete structures. 885 p. 8 vo. il. 1918. \$6.00

**CONTENTS:** I—Materials. II—General methods of construction. III—Construction plant. IV—Concrete floors and floor surfaces, side walks and roadways. V—Properties of cement, mortar and plain concrete. VI—General properties of reinforced concrete. VII—Beams and slabs. VIII—Columns. IX—Bending and direct stress. X—Moments in rigid building frames. XI—Buildings. XII—Foundations. XIII—Retaining walls. XIV—Slab and girder bridges. XV—Concrete floors and abutments for steel bridges. XVI—Arches. XVII—Hydraulic structures. XVIII—Miscellaneous structures. XIX—Estimating. APPENDICES: A—Standard specifications and tests for Portland cement. B—Working stresses. C—Rules pertaining to flat-slab design. D—Standard notation.

**HOOL, GEORGE A., and JOHNSON, NATHAN C.** Handbook of Building Construction. Two volumes (not sold separately). 1475 p. 8 vo. flexible, il. 1920. Per set, \$10.00

Modern reference data for architects, designing and constructing engineers and contractors. The book covers thoroughly the design and construction of the principal kinds and types of buildings with their mechanical and electrical equipment. Every detail of practical construction is considered. This handbook is complete and thorough in every detail.

**CONTENTS:** Part I—Design and Construction. I. Elements of structural theory. II. Designing and detailing of structural members and connections. III. Structural data. IV. General designing data. V. Construction methods. VI. Construction equipment. VII. Building materials. Part II—Estimating and Contracting. I. Estimating steel buildings. II. Estimating concrete buildings. III. Architectural practice. IV. Contracts. V. Specifications. Part III—Mechanical and Electrical Equipment. I. Heating, ventilation and power. II. Water supply data and equipment. III. Sewage disposal. IV. Waterless toilet conveniences. V. Plumbing and drainage. VI. Electrical equipment. VII. Electric lighting and illumination. VIII. Gas lighting. IX. Gas fitting. X. Elevators. XI. Mechanical refrigeration. XII. Communicating systems. XIII. Lighting protection. XIV. Vacuum cleaning equipment.

**HOOPER, LUTHER.** Silk: Its Production and Manufacture. (Pitman's Common Commodities and Industries.) 144 p. il. 12 mo. 1920. \$1.00

**CONTENTS:** The value of silk, and source of supply. The silk worm. Varieties of silk-producing moths. History of silk and sericulture. The practice of sericulture. Reeling from the cocoons. Silk throwing and winding. Silk dyeing. Varieties of silk thread. Ancient silk weaving. The ornamental silk webs of China. The simple and compound draw loom for silk weaving. Satin damask weaving. Silk weaving in the East. A. D. 1200; The introduction of silk weaving into Europe. Development of European silk weaving, thirteenth to sixteenth century. English silk weaving to about 1800. Modern silk weaving.

**HOOVER, T. J.** Concentrating Ores by Flotation. 320 p. 8 vo. 1916. \$3.75

**HOPKINS, A. A., Editor.** Scientific American Cyclopaedia of Formulas. 1000 p. 8 vo. il. 1911. \$5.00

**HOPKINS, NEVIL M.** Outlook for Research and Invention. 241 p. 12 mo. il. 1919. \$2.00

**HORWOOD, C. B.** Gold Deposits of the Rand. 436 p. 8 vo. 1917. \$6.00

**HOVESTADT, H.** Jena Glass. Translated and Edited by J. W. Everett. 419 p. 8 vo. 1902. \$7.20

**CONTENTS:** Optical properties of glass. The perfecting of optical systems by new glasses. The microscope. Photographic optics. The telescope. The mechanical properties of glass. Thermal properties of glass; After-working and thermometry; Chemical behavior of glass surfaces; Electrical and magneto-optic properties of glass.

**HOWE, HARRISON E.** The New Stone Age. 400 p. 8 vo. il. 1921. \$3.00

**CONTENTS:** Raw materials and processes of manufacture. By-products in the cement industry; Theory of Portland cement setting. Other types of cement. Concrete. Reinforcement. Some factors in influencing permanence. Some phases of cement and concrete testing. Art in cement and concrete. Applying cement mortar. Highways. Concrete in railroad; Bridges. Concrete in waterways. Concrete ships. Building for a thousand years; Waterproofing and surface protection. Concrete tanks; Concrete products; Concrete on the farm; Military and miscellaneous uses.

**HOWE, HENRY MARION.** The Metallography of Steel and Cast Iron. 641 p. 4 to. il. 1916. \$10.00

This quarto volume of over 600 pages by one of the best known of American metallurgists "consists of two distinct parts, an introduction to the new science of microscopic metallography, as applied to steel and to cast iron, and an extended study of the very new branch of that science, the mechanism of plastic deformation"—subjects, the

application of which forms the basis for the great advances to be expected in the metallurgy of iron and steel. There are many reading references and carefully prepared drawings, including excellent photomicrographs.

**HOWE, I. ALLEN.** Stone and Quarries. (Pitman's Common Commodities and Industries.) 137 p. il. 12 mo. 1920. \$1.00

**CONTENTS:** The stone industry; Rocks, stones and minerals; Classification of stones; Types of stone and their modes of occurrence; Limestones; Sandstones, Slate, Marble, Granites, Other igneous rocks; Employment of stone, Building and engineering, Roads and paving; Decoration and sculpture. Miscellaneous uses of stone, Quarrying; The preparation of stone for the market. Appendix. List of books.

**HOYT, S. L.** Metallography. Part One—Principles. 256 p. 8 vo. il. 1920. \$3.00

**CONTENTS:** Constitution diagrams. Preparation of metallic alloys, Metallic microscopy, Microstructure of metals and alloys, Pyrometry and thermal analysis, Physical properties, Mechanical properties.

Part Two—The Metals and Common Alloys. 462 p. 8 vo. il. 1921. \$5.00

**CONTENTS:** The pure metals. White metal alloys, Light metal alloys, Brass and bronzes, Steel and cast iron, Special steels.

Part Three—on Technical Practice, is in preparation.

**HUBBARD, E.** The Utilization of Wood Waste. Third edition. Translated from the German of the second revised and enlarged edition by M. J. Salter. 208 p. 16 mo. il. \$4.50

**CONTENTS:** Utilization of sawdust, Employment of sawdust as fuel, with and without simultaneous recovery of charcoal and the products of distillation, Manufacture of oxalic acid from sawdust; Manufacture of spirit (ethyl alcohol) from wood waste; Patent dyes (organic sulphides, sulphur dyes or mercapto dyes); Artificial wood and plastic compositions from sawdust production of artificial wood compositions for moulded decorations, Employment of sawdust for blasting powders and gunpowders, Employment of sawdust for briquettes, Employment of sawdust in the ceramic industry and as an addition to mortar, Manufacture of paper pulp from wood, Various applications of sawdust and wood refuse; The production of wood wool.

**HUBBARD, PREVOST.** Laboratory Manual of Bituminous Materials; for the use of students in highway engineering. 153 p. 8 vo. il. 1916. \$1.50

A complete practical guide for the student or highway engineer who has a laboratory at his disposal and who desires not only to make the more common and widely used tests with a reasonable degree of accuracy, but to interpret the results as well. Part I defines and classifies the various bituminous materials, describes the processes of refining, and gives information concerning laboratory equipment. Author is a lecturer in Columbia University, and Chief of the Division of Road Material Tests in the United States Government Office of Public Roads.

**HUDDERS, E. R.** Indexing and Filing. 304 p. 12 mo. 1918. \$3.00

**HUDSON, O. F.** Iron and Steel. An introductory text-book for engineers and metallurgists. With a section on Corrosion by Guy D. Bengough. 184 p. 8 vo. il. \$3.00

**CONTENTS:** Mechanical testing. Smelting of iron ore. Properties of cast iron. Foundry practice. Mixing cast iron for foundry work. Malleable cast iron. Wrought iron. Manufacture of steel. Cementation process. Crucible steel. Bessemer process. Open hearth process. Electric furnaces. Mechanical treatment of steel. Reheating. Impurities in steel. Constitution of iron-carbon alloys. Heat treatment of steel. Special steels. Steel castings. Case hardening. Welding. The corrosion of steel and iron.

**HUEBNER, JULIUS.** Bleaching and Dyeing of Vegetable Fibrous Materials. 457 p. 8 vo. 1912. \$7.50

**CONTENTS:** The vegetable fibres. Water. Chemical and mordants. Bleaching. Mercerizing. Mineral colours. The natural colouring matters. Basic cotton dyestuffs. Substantive cotton dyestuffs. Sulphur dyestuffs. Acid and resorcin dyestuffs. Insoluble azo colours, produced on the fibre. The vat dyestuffs. Mordant dyestuffs. Colours produced on the fibre by oxidation. Dyeing machinery. Estimation of the value of dyestuffs. Appendix.

**HULTGREN, AXEL A.** Metallographic Study on Tungsten Steels. 95 p. 8 vo. 5 diagrams, 76 photo micrographs. 1920. \$3.00

Translation of a Swedish paper, combined with critical reviews of later published results by other investigators. The studies on which the author's theories are based were undertaken in the Institute of Technology, Charlottenburg. The author's work in harmonizing conflicting data and views constitutes a step forward in the field of tungsten steel.

**CONTENTS:** Part I. The Transformation of Tungsten Steels During Different Heat Treatments and the Structures Thereby Formed. Previous investigations; Composition. Experimental methods. The experiments and their results. The stability of the austenite. Pearlite transformation. Secondary ferrite discussion of the results obtained; Critical discussion of previous investigations. Part II. Carbides in Tungsten Steels. Previous investigations; The author's investigations; Preliminary discussion. Carburation experiments. Welding experiments; Iron-tungsten-carbon alloys. Partial melting of tungsten steels; Separation and analyzing of the X-carbide; Review of carbides and similar constituents found in microscopic investigation of iron-tungsten-carbon alloys. Tentative iron-tungsten-carbon diagram; Criticism of previous investigations; Some practical consequences of free carbides in tungsten steels. Supplement Concerning Carbides in Other Alloy Steels. Appendix. Investigations on tungsten steels by Houllé and Murakami.

**HUMPHREY, J.** Drugs in Commerce. (Pitman's Common Commodities and Industries.) 113 p. il. 12 mo. 1921. \$1.00

**CONTENTS:** Drugs in commerce, etc.; Acacia bark, etc., Camphor and camphor oil, etc.; Coca leaves and cocaine, etc., Grindelia, etc.; Nutmegs and nutmeg oils, etc., Sassafras root, etc.

**HUNTER, J. A.** Wool: from the raw material to the finished product. 118 p. 12 mo. 1912. \$1.00

**HUNTINGTON, E. VERMILYE.** Handbook of Mathematics for Engineers. Reprint of the sections 1 and 2 of Marks' Mechanical Engineers' Handbook. 191 p. 12 mo. 1918. \$2.00

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CONTENTS: History and development of butter industry; Creamery organization, construction and equipment; Buying milk and cream; Separation of milk, Receiving milk and cream; Neutralization of sour cream; Pasteurization; Cream ripening and starters; Churning, Washing, salting and working; Packing butter; The overrun, Markets and marketing; Butter storage; Butter scoring; Butter defects; Composition and properties of butter, milk, cream, skim milk and buttermilk; Healthfulness, food value and biological properties; Definitions and standards; Whey butter, renovated butter and ladles; Standardization, tests and chemical analyses of milk, cream, skim milk, buttermilk and butter

**HURLBURT, E. N.** *Tycoos Gravity and Temperature Tables for Mineral Oils.* 204 p. 12 mo. 1918. \$1.00

**HURST, GEORGE H.** *Dictionary of Chemicals and Raw Materials Used in the Manufacture of Paints, Colours, Varnishes and Allied Materials.* 370 p. 8 vo. 1917. \$5.00

**HURST, GEORGE H.** *A Manual of Painters' Colours, Oils and Varnishes.* Revised by Noel Heaton, B.Sc., F.C.S. With a chapter on Varnishes by M. B. Blackler, Ph.D. Fifth edition, revised and enlarged. 528 p. 8 vo. il. 1913. \$4.50

CONTENTS: Introductory. The properties of pigments in general white pigments—The lead and zinc whites. Mineral whites. Red pigments. Orange and yellow pigments. Green pigments. Blue pigments. Brown pigments. Black pigments. Organic pigments and lakes. Oils and solvents, gums, glues, and resins. Varnishes. Paint. Appendix A. Appendix B. Index.

**HURST, GEORGE H.** *Soaps. A Practical Manual of the Manufacture of Domestic, Toilet and Other Soaps.* Second edition. 385 p. 8 vo. il. 1907. \$6.00

CONTENTS: Soap Makers' Alkalies; Soap Fats and Oils; Perfumes, Water as a Soap Material; Soap Machinery; Technology of Soap Making; Glycerine in Soap-lyes; Laying Out a Soap Factory; Soap Analysis

**HURST, GEORGE H., and SIMMONS, W. H.** *Textile Soaps and Oils.* A handbook on the preparation, properties, and analyses of the soaps and oils used in textile manufacturing, dyeing and printing. Third edition, revised and partly rewritten. 204 p. 8 vo. il. 1921. \$4.00

CONTENTS: *Textile soaps.* Introductory; Methods of making soaps; Special textile soaps. Relation of soap to water for industrial purposes; Treating waste soap liquors; Soap analysis. *Animal and vegetable oils and fats.* Tallow, lard, bone grease, tallow oil, lard oil, whale oil or train oil, Paul oil, palm nut or palm kernel oil, cocoanut oil, olive oil, arachis oil, cotton seed oil, soya bean oil, linseed oil, castor oil, maize (corn) oil, rape oil. *Glycerine.* *Textile oils.* Wool oils, oleines, wool oils, oleic acid, blended wood oils, oils for cotton dyeing, printing and finishing, color oil, turkey red oil, turkey red oil, alizarine oil, oleine, oxy-turkey-red oil, soluble oil, analysis of turkey red oil; finishers' soluble oil, finishers' soap softeners, oil and fat analysis.

**HUTSON, A. C.** *Fire Prevention and Protection; a compilation of insurance regulations covering modern restrictions on hazards.* Third edition. 778 p. 12 mo. il. 1918. \$4.25

Has chapters on explosives, pyroxylin plastic, inflammable liquids, gases and vapors, etc.

**HYDE, FREDERIC S.** *Solvents, Oils, Gums, Waxes and Allied Substances.* 182 p. 8 vo. \$2.00

These notes are intended for the use of factory chemists and others who may desire a short reference book on commercial organic products.

CONTENTS: Various solvents and fluids. Camphors, essential oils and balsams. True gums, gum resins and bitumens. Carbohydrates, albuminoids and proteids. Oils and fats. Comparisons of oils and fats. Linseed oil. Insoluble soaps. Fatty acids. Waxes. Alkaloidal substances. Bitter principles. Miscellaneous substances.

**IBBETSON, A.** *Tea: From Grower to Consumer.* (Pitman's Common Commodities and Industries.) 114 p. il. 12 mo. 1920. \$1.00

CONTENTS: Description of tea plant, Large consumers, Chemical analysis, Various methods of cultivation and manufacturing, Tea in India and other countries, Modern methods of cultivation and manufacturing, Taxation of tea, Public sales, Sampling and buying; Discriminating tasting, Blending, packing and storing, How to create interest in finer tea, Fine tea sold at Mincing Lane

**IBBOTSON, F., and AITCHISON, L.** *The Analysis of Non-Ferrous Alloys.* By Fred. Ibbotson, B.Sc., B. Met., A.R.C.Sc. I.; and Leslie Aitchison. 238 p. 8 vo. 1915. \$2.75

**IDDINGS, J. P.** *Rock Minerals; their chemical and physical characters and their determination in thin sections.* 617 p. 8 vo. 1911. \$6.00

**INGLE, HARRY.** *A Manual of Oils, Resins, and Paints; for students and practical men. In three volumes. Vol. I Analysis and Valuation.* 248 p. 12 mo. il. 1915. \$2.00

This volume is for practical paint workers and for all those interested in applied industrial chemistry. Each volume in this great series is to be complete in itself,—this one gives a thorough tabulated account of the methods of analysis and valuation

CONTENTS: Introductory. Introduction to the chemistry of oils. Physical tests. Chemical tests. Qualitative tests for oils. The classification of oils. The systematic examination of oils, resins and waxes. Technological analysis. Table of oil constants. Index.

**INGLE, H.** *Manual of Agricultural Chemistry.* Fourth Edition. 12 mo. 1920. \$5.00

CONTENTS: The Atmosphere; Soil; Reactions Occurring in Soils; Analysis of Soils; Manures; Analysis of Manures; Constituents of Plants, The Plant; Crops; The Animal; Foods and Feeding; Milk and Milk Products; Analysis of Milk; Miscellaneous Products Used in Agriculture.

**INGALLS, W. R.** *Lead and Zinc in the United States.* By Walter Renton Ingalls, Editor of the Engineering and Mining Journal. 370 p. 8 vo. il. 1908. \$4.00

In this book Mr. Ingalls has presented the results of a study of the lead and zinc industries in the United States, covering the mining and metallurgy of the two metals, and all phases of the industries. The book is indeed a history of these industries in the United States, but it is a history purely from the economic standpoint.

**INGALLS, W. R.** *Lead Smelting and Refining.* Edited by Walter Renton Ingalls. 327 p. 8 vo. 1906. \$3.00

A compilation of the best contributions by leading authorities to the Engineering and Mining Journal.

CONTENTS: Notes on lead mining. Roast-ore smelting. Sintering and briquetting. Smelting in the blast furnace. Lime roasting of galena. Other methods of smelting. Dust and fume recovery. Blowers and blowing engines. Lead refining. Smelting works and refineries.

**INGALLS, W. R. (Editor).** *Notes on Metallurgical Mill Construction.* Edited by Walter Renton Ingalls. 256 p. 8 vo. 1906. \$2.00

A full discussion by leading authorities of the engineering problems connected with metallurgy.

CONTENTS: Part I.—Brickwork and concrete. II.—Building construction. III.—Ore crushing machinery. IV.—Driers and drying. V.—Conveyors and elevators. VI.—Disposal of tailings. VII.—Miscellaneous.

**INGALLS, W. R.** *Metallurgy of Zinc and Cadmium.* By Walter Renton Ingalls. Second edition. 701 p. 8 vo. 1906. \$7.00

CONTENTS: Zinc and ores. Calcination and calamine. Blende roasting. Roasting furnaces. Utilization of the sulphurous gases. General principles of zinc distillation. Retort and condenser manufacture. Fuel and systems of combustion. Chimneys, heat recuperation and furnace design. Distillation furnaces. Practice in distillation. Losses in distillation. Refining impure zinc and composition of commercial spelter. Cadmium and its recovery. Cost of producing zinc. Design and construction of smelting works. Examples from practice. Proposals to smelt zinc ore in the blast furnace. Manufacture of zinc dust, zinc white, zinc sulphate and zinc chloride.

**INNES, C. H.** *Centrifugal Pumps, Turbines and Water Motors.* Fifth edition. 350 p. 12 mo. il. 1909. \$3.00

CONTENTS: Motion of water under pressure; Measurement of power; Energy of rising and falling water; Friction in piping. Loss of energy. Hydraulic engines; The turbine; Suction tube; Turbine governors; Various water wheels; The steam turbine, Centrifugal pump, Fan, Hydraulic works at Niagara Falls; Hydraulic buffers.

**INNES, C. H.** *The Fan: Including the Theory and Practice of Centrifugal and Axial Fans.* 258 p. 12 mo. il. 1904. \$4.00

CONTENTS: Conservation of energy; Losses of head; Manometer, anemometer and pilot tube; Calculation of density of air; Change of moment of momentum. Theoretical characteristics; Design of fans; Variation of pressure in centrifugal fans; Various tests on fans; Comparison between theory and experiment; High pressure fans; Theory of propeller ventilating fans; Experiments; Types of propeller ventilating fan.

**IVENS, EDMUND M.** *Pumping by Compressed Air.* Second edition, revised and enlarged. 266 p. 124 il. 8 vo. 1920. \$4.00

Some thirty pages of text and eighteen illustrations, together with several formulae and tables, have been added. This book now contains all the information that is necessary for the intelligent study, design, installation, and operation of a compressed air pumping plant of any size or capacity.

CONTENTS: Pumping water by direct action through pistons. The displacement pump; Return air system; The air lift. Submergence; Velocities. Central pipe systems (open end and perforated end); Commercial systems—the Bacon system, the Harris system, the Weber system; Compression generalities; The air card and air compressor efficiency; The compressor; Flow of compressed air in pipes; Flow of water in pipes. A properly designed installation—the water pumps, the sewerage pumps, the wells. Operation curves. Index.

**JACKSON, PERCY G.** *Boiler Feed Water. A Concise Handbook of Water for Boiler Feeding Purposes.* 102 p. 12 mo. 1920. \$2.00

**JACOUTET, AUGUST.** *Chocolate and Confectionery Manufacture.* 226 p. 8 vo. 1917. \$7.50

**JEANS, J. D.** *The Dynamical Theory of Gases.* Third edition. 442 p. 1921. \$10.00

In this edition the author gives greater prominence to the Quantum Theory by adding a chapter on Quantum Dynamics, dealing mainly with the quite recent works of Ehrenfest, Sommerfeld, Epstein and others, necessarily a very brief introductory of the mysteries of the subject, but a stimulus to English readers of this branch of science, of which development has, so far, been left mainly to other nations.

**JEHL, F.** *The Manufacture of Carbons for Electric Lighting and Other Purposes.* 232 p. 8 vo. il. 1915. \$5.00

CONTENTS: Physical Properties of Carbon; Historical Notes; Facts Concerning Carbon; Modern Process of Carbon Manufacture; A "New" Raw Material; Gas Generators; Furnace; Estimation of High Temperatures; Gas Analysis; Building a Carbon Factory; Capital Necessary; Soot or Lampblack; Soot Factories; American Methods of Manufacture.

**JENNINGS, ARTHUR S.** *Commercial Paints and Painting.* 224 p. 8 vo. 1914. \$2.00

CONTENTS: Object of painting; Durability of paint; Cost of cheap and superior paints compared; Cost of keeping property painted; Specifying paints; The materials used in painting; Conditions which determine the economic value of the paint; Simple tests for painters' materials; The paint most suitable for different surfaces; How paint and varnish should be applied; Paint and color mixing; Tools and plant; Defects in painters' work; Specifications for painters' and decorators' work; Painting by mechanical means.

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**JENNINGS, ARTHUR SEYMOUR.** *Painting by Immersion and by Compressed Air.* A practical handbook. 272 p. 8 vo. il. 1915. **\$3.50**

A well illustrated work describing in detail the principal appliances (with makers' names and addresses) for spraying, dipping, and "flowing-on" of paint, lacquer, varnish and similar liquids. Cites 250 products to which the operations may be applied. "There is abundant evidence to prove that the application of paint, either by means of dipping, spraying or other mechanical means, effects an enormous saving of time over the old method of using brushes, while the coats of paint are more durable and thorough. This saving of time not only lowers the cost of production to a very considerable extent, but it permits of a large increase in the output."—Preface

**JENNINGS, ARTHUR S.** *Paint and Color Mixing.* A practical handbook for painters, decorators, paint manufacturers, artists, and all who have to mix colors. Containing over 300 samples of actual oil- and water paints and water colors of various colors, and upwards of 1,500 different color mixtures. 245 p. 8 vo. il. 1915. **\$2.50**

The fifth edition of this practical work (first published in 1904) represents thorough revision and important additions, including new chapters on mixing and matching colors, straining colors, putty hard stopping, knife and brush filling, two hundred standardized colors, and color nomenclature.

**JENNINGS, A. S.** *Paints and Varnishes.* (Pitman's Common Commodities and Industries.) 108 p. il. 12 mo. 1920. **\$1.00**

**CONTENTS:** The characteristics of a good paint. The principal pigments used in paint making. The thinners used in paint. Paint mixing: the application of paints, etc. Whitewashes and distempers. Service tests of paints and varnishes. Machinery used in paint making. Varnishes and enamels. Tables, etc.

**JOBLING, E.** *Catalysis and Its Industrial Applications.* Second edition. 152 p. 12 mo. 1920. **\$2.25**

**JOHANNSEN, A.** *Manual of Petrographic Methods.* By Albert Johannsen, Ph.D., Associate Professor of Petrology, The University of Chicago. Second edition. 640 p. 8 vo. il. 1918. **\$7.00**

A more complete work than has ever appeared in English on modern petrographic-microscopic methods. It is based on exhaustive search of the foreign publications and original investigations.

**CONTENTS:** I.—Mineralogical principles. II—Stereographic projection. III.—A few principles of optics. IV.—Isotropic media. V. and VI.—Anisotropic media. VII.—Lenses. VIII., IX. and X.—The microscope. XI.—Various modern microscopes. XII.—Selecting, using and taking care of a microscope. XIII., XIV. and XV.—Observation by ordinary light. XVI.—Measurements under the microscope. XVII.—Drawing apparatus. XVIII.—Rotation apparatus. XIX.—The color of minerals. XX.—Monochromatic light. XXI.—Examination by plane polarized light. XXII.—Interference colors. XXIII.—to XXVIII.—Examination between crossed nicols. XXIX. and XXX.—Observations by convergent polarized light. XXXI.—Dispersion of light in crystals. XXXII.—The petrographic microscope as a conoscopie, and the methods of observing interference figures. XXXIII.—Determination of the optical character of a crystal by means of its interference figure. XXXIV.—Measurement of the optical axial angle by convergent polarized light. XXXV.—Measurement of the optic axial angle by means of a rotation apparatus. XXXVI.—Determination of other properties than V by means of the universal stage. XXXVII.—Optical anomalies. XXXVIII.—Determination of specific gravity. XXXIX.—The mechanical separation of rock constituents. XL.—Microchemical reactions. XLI.—Preparation of thin sections of rock. XLII.—Petrographic collections. **APPENDIX.**

**JOHNSON, A. E.** *The Analyst's Laboratory Companion.* By Alfred E. Johnson, B.Sc., London. F.I.C., A.B.R.S.C.I. Fourth edition, enlarged. 12 mo. 1912. **\$2.00**

A collection of tables and data, together with numerous examples of chemical calculations and concise descriptions of several analytical processes for the use of analysts, agricultural, brewers, and industrial chemists and students.

**JOHNSON, CHARLES MORRIS.** *Rapid Methods for the Chemical Analysis of Special Steels, Steel-Making Alloys and Graphite.* Third edition, revised. 552 p. 8 vo. 70 il. 1920. **\$6.00**

An unusually thorough revision, including all of the important new metals as well as new methods for the analysis of older ones. Anyone who knows general chemistry can follow the author's instructions and get real results.

**JOHNSON, JOSEPH B.** *Materials of Construction.* Fifth edition, rewritten by M. O. Withey and James Aston. Edited by F. E. Turneaure. 840 p. 8 vo. il. 1919. **\$6.00**

**CONTENTS:** Synopsis of the principles of mechanics of materials; Machines and appliances for mechanical tests; The mechanical testing of structural materials; Characteristics, physical properties, and uses of wood; The deterioration and preservation of timber; Building stone; Structural clay products; Portland cement; Natural and other hydraulic cements; Limes and plasters; Methods of testing hydraulic cements; Making mortar and concrete; The physical properties of mortar and concrete; Portland cement products; Metals and their ores; Reduction of iron from its ores; Manufacture of wrought iron and steel; The manufacture of iron and steel shapes; Formation and structure of alloys; Constitution of iron and steel; Properties of wrought iron; Properties of steel; Alloy steels; Cast iron and malleable cast iron; Nonferrous metals and alloys; The effect of temperature on the mechanical properties of metals; Fatigue of metals; The corrosion of metals.

**JOHNSON, JOSEPH ESREY.** *Blast-furnace Construction in America.* 415 p. 8 vo. il. 1917. **\$5.00**

This comprehensive work, based partly upon investigations by the author, fills a long felt want in metallurgical literature. Enough of recent history is given to show the present trends of the art. Describes the handling of the raw materials, filling the furnace, the equipment of the boiler plant, blowing apparatus, hot blast stoves, stacks, cleaning and washing of the gas, handling the iron and cinder, auxiliaries, and general arrangement of the plant. Of special note is the chapter on the dry blast.

**JOHNSON, JOSEPH E.** *Principles, Operation and Products of the Blast Furnace.* 553 p. 8 vo. 1918. **\$6.00**

"A thoroughly detailed discussion of the operation of the blast furnace."

**JOHNSON, ROSWELL H., and HUNTLEY, L. G.** *Principles of Oil and Gas Production.* 371 p. 8 vo. il. 1916. **\$4.50**

A general treatise on the production of oil and gas with reference to American conditions.

**CONTENTS:** Varieties of oil and gas. Origin of oil and gas. Reservoirs of oil and gas. Accumulation of oil and gas. Pressure in oil and gas reservoirs. Origin of the shape of reservoirs. Classification of the attitude of reservoirs. Application of the different attitudes to accumulation. Locating oil and gas wells. Oil and gas lands. Oil and gas well drilling. "Bringing in a well." Management of oil wells. Completing the extraction of the oil. Management of gas wells. Condensation of gasoline from gas. Reports upon oil and gas prospects or upon an oil property. The valuation of oil and gas properties. Oil market and the future supply.

**JOHNSON, W. H.** *Cultivation and Preparation of Para Rubber.* 186 p. 8 vo. 1909. **\$3.00**

**JOHNSTON, J. F. W., and CAMERON, CHAS.** *Elements of Agricultural Chemistry.* Twenty first edition. 502 p. 8 vo. il. 1912. **\$2.60**

**CONTENTS:** Chemical Nomenclature. Constituents of Plants and Animals. Composition of the Atmosphere. Growth of Plants. Soils; Rock. Element of Soils. Lime, Irrigation. Exhaustion of Soils; Germination of Seeds. Assimilation by Plants. Manures, Manuring; Animal Nutrition. Vegetable Foods; Fodder Crops, Seed Furnishing Crops. Roots and Tubers. Milk. Butter. Cheese. Food Rations.

**JOHNSTONE, S. J.** *Rare Earth Industry; including the manufacture of incandescent mantles, pyrophoric alloys and electrical glow lamps.* 136 p. 8 vo. 1915. **\$4.00**

**JONES, E. GABRIEL.** *Chemistry for Public Health Students.* 244 p. 8 vo. 1919. **\$2.50**

**CONTENTS:** Use of balance. Volumetric analysis; Milk; Butter and margarine, Alcoholic beverages; Various foods, their composition and adulteration with some details of the methods of analysis; Methods of preserving foods, Water, Sewage effluents, Air, Disinfectants; Preparation of solutions.

**JONES, E. H.** *Smelter Construction Costs. Unit construction costs from the smelter of the Arizona Copper Co., Ltd.* By E. Horton Jones. 152 p. 8 vo. il. 1914. **\$2.00**

Republished by special arrangement with the American Institute of Mining Engineers. Smelter construction costs, in the fullest detail, are given in this book. The data are based on construction of the Arizona Copper Company's new smelters at Clifton, Arizona, completed February, 1914.

**JONES, FRANKLIN DAY.** *Mechanisms and Mechanical Movements; a treatise on different types of mechanisms and various methods of transmitting, controlling and modifying motion, to secure changes of velocity, direction, and duration or time of action.* 310 p. 8 vo. il. 1918. **\$2.50**

**JONES, HARRY C.** *The Electrical Nature of Matter and Radioactivity.* Third edition, revised. 220 p. 8 vo. 1915. **\$2.25**

(Author was professor of physical chemistry at Johns Hopkins University.)

**CONTENTS:** The electrical conductivity of gases; The determination of the mass of the negative ion in gases; Nature of the corpuscle; The electrical theory of matter; The nature of the atom in terms of the electron theory. The X-rays. The discovery of radium; Other radioactive substances in pitchblende. The Alpha rays. The Beta and Gamma rays. Other properties of the radiations. Production of heat by radium salts; Emanation from radioactive substances. Helium produced from the emanation. Induced radioactivity. Production of radioactive matter. Theoretical considerations. Wide distribution of radioactive matter and the origin of radium.

**JONES, H. C.** *The Elements of Physical Chemistry.* By the late H. C. Jones. Fourth edition, revised and enlarged. 650 p. 8 vo. 1915. **\$4.75**

Considerable new matter has been incorporated in this latest edition, the matter, for the most part, being inserted at the ends of the chapters.

**JONES, HARRY C.** *"The Freezing-Point, Boiling-Point, and Conductivity Methods."* Second edition, 76 p. 1912. **\$1.25**

**CONTENTS:** The freezing point method; Theoretical discussion; The application of the freezing point method to the determination of molecular weights in solution. The application of the freezing point method to the measurement of electrolytic dissociation. The boiling point method; Theoretical discussion; The application of the boiling point method to the determination of molecular weights in solution. Results for a few substances. The application of the boiling point method to the measurement of electrolytic dissociation. The conductivity method; The application of the conductivity method to the measurement of electrolytic dissociation.

**JONES, HARRY C.** *The Nature of Solution.* With a biographical memoir by Prof. E. Emmet Reid and tributes by Professors Arrhenius, Ostwald and Woodward. 406 p. 8 vo. 1917. **\$3.75**

**CONTENTS:** Importance of solution; Earlier views as to the nature of solution; The osmotic pressure of solutions. Relations between solutions and gases demonstrated by Vant Hoff; The theory of electrolytic dissociation as announced by Arrhenius. Diffusion in solution; Depression of the vapor tension of a solvent by substances dissolved in it. Depression of freezing point of a solvent by the solute; Aqueous solutions of acids, bases and salts. Electrolytes. Some electrical properties of aqueous solutions of electrolytes; Solution in nonaqueous and in mixed solvents; Colloidal solutions. Solutions in solids as solvents; The newer hydrate theory. The solvate theory of solutions.

No subject in chemistry has received more attention, especially during the last quarter of a century, than that of solution. This is due primarily to the fundamental significance of solution for chemical science. Solutions in the broad sense of the term are fundamental not only for chemistry, but for geology and the various branches of biology.

**JONES, HARRY C.** *New Era in Chemistry.* 336 p. 12 mo. 1913. \$5.00

An exposition of the difference between the chemistry of to-day and that of twenty-five years ago, showing in what this difference consists, how these new developments were brought about and by whom. The author writes with authority, having known well the men who were instrumental in bringing about this "New Era."

**JONES, M. W.** *The Testing and Valuation of Raw Materials Used in Paint and Color Manufacture.* 88 p. 12 mo. 1900. \$2.50

CONTENTS: Compounds of: aluminum; iron, potassium, chromium; tin; copper, lead, zinc, arsenic; antimony, calcium, barium, cadmium, mercury, cobalt; carbon; china clay, ultramarine, oils

**JORGENSEN, ALFRED.** *Micro-organisms and Fermentation.* Fourth edition, completely revised. Translated by S. H. Davis. M.Sc. 489 p. 8 vo. il. 1911. \$6.00

A textbook written by one of the foremost exponents of the honored Danish School of Micro-Biological Research, and by a pioneer of world wide reputation in the industrial application of selected types of yeast.

In comparison with the enormous output of works on the organisms of disease, little has yet been published in English on the technical application of micro-biology. This book covers ground which is not fully surveyed in any existing treatise. The necessity of embodying the results of ten years' research has led to such a mass of additions and alterations in the last English edition that this must be regarded as a new work. It is based on the fifth German edition.

CONTENTS: Microscopical and physiological examination. Biological examination of air and water, bacteria, moulds, yeasts. The pure culture of yeast on a large scale. Bibliography. Index.

**JUEPTNER, H. von.** *Heat Energy and Fuels.* Pyrometry, combustion analysis of fuels and manufacture of charcoal, coke and fuel gases. By Hanns von Jueptner, translated by Oscar Nagel. Ph.D. 306 p. 8 vo. il. 1908. \$3.00

GENERAL REMARKS: Forms of energy. The measurement of high temperature (pyrometry). Optical methods of measuring temperatures. Combustion heat and its determination. Direct methods for determining the combustion heat. Incomplete combustion. Combustion temperature. Fuels (in general). Wood. Fossil solid fuels (in general). Peat. Brown coal (lignite). Bituminous and anthracite coals. Artificial solid fuels. Charcoal. Peat coal. Coke and briquettes. Coking apparatus. Liquid fuels. Gaseous fuels. Producer gas. Water gas. Dowson gas, blast furnace gas and regenerated combustion gases. Apparatus for the production of fuel gases.

**JUEPTNER, H. von.** *Siderology: The Science of Iron.* (The Constitution of Iron Alloys and Iron.) Translated from the German by Charles Salter. 352 p. 8 vo. il. \$5.00

CONTENTS: Introduction. The Theory of Solution. Micrography. Chemical Composition of the Alloys of Iron; Chemical Composition of Slag

**JULIAN, H. FORBES and SMART, EDGAR.** *Cyaniding Gold and Silver Ores.* Second edition. 484 p. 8 vo. il. 1907. \$7.00

CONTENTS: Early history of the cyanide process. Preliminary investigations. Crushing to cyanide. Weighing and measuring. Percolation and leaching. Principles involved in the dissolution and precipitation of metals. Dissolution of the gold and silver. Temperature effects. Dissolution of gold physically considered. Absorption of air by solutions. Action of various cyanide solutions. Sources of loss of cyanide. Precipitation of gold and silver. Precipitation by zinc. Electrical precipitation. Electrical precipitation in practice. Other methods of precipitation. Cleaning up, refining and smelting. Applications of the cyanide process. Double treatment. Direct treatment of dry crushed ore. Crushing with cyanide solution. Slimes. Dissolving the gold and silver slimes. Theory of extraction by successive washings. Treatment by agitation and natural settlement and subsequent processes. Slime treatment with filter presses. Design and construction of vats. Construction of other essential parts of a cyanide plant. Piping, cocks, launders, and buildings. Handling materials. Ropes and gear for haulage. Belt conveyors, tailings, wheels and pumps. Design and construction of spitzlute and spitzkasten. Cost of cyanide plants. Cost of treatment. Complete cyanide plants.

**KAHN, MORITZ.** *Design and Construction of Industrial Buildings.* 172 p. 8 vo. 1917. \$3.00

**KANSAS CITY TESTING LABORATORY.** *Petroleum, Asphalt and Natural Gas.* 500 p. 12 mo. il. 1920. \$5.00

CONTENTS: Statistics of production and refining. Geology and economics of oil and gas. Chemical and physical properties of petroleum and its products. Specifications for petroleum products. Methods of analysis and valuation. Storage and transportation. Tank gauging and measuring. Refinery engineering. Cracking. Fuel oil. Tables. Patents; Bibliography

**KANTHACK, R.** *Compiler. Tables of Refractive Indices.* Vol. 1, Essential Oils. 148 p. 8 vo. 1918. \$6.00

"In the present volume, the first of the series, an endeavor is made to give as complete a list as possible of this property of essential oils. The scattered literature of the subject has been carefully sifted by the compiler, and a large number of measurements have been compiled with references to the original papers. This volume will serve to some extent as a bibliography of essential oils, and it may be noted that over 500 distinct oils and 1,500 measurements are recorded."

**KAUTNY, T.** *Autogenous Welding and Cutting.* By Theodore Kautny. 157 p. 12 mo. il. 1915. \$1.25

A pocket book giving in compact form for ready reference such information and instruction as will help the works engineer, welder and student to a more thorough understanding of the art of autogenous welding and cutting. It is an authoritative translation of a widely known German work.

**KAYE, G. W. C., and LABY, T. H.** *Tables of Physical and Chemical Constants and Some Mathematical Functions.* By G. W. C. Kaye, D.Sc., The National Physical Laboratory, London, and T. H. Laby, B.A., Professor of Physics, The University of Melbourne. Third edition. 160 p. 8 vo. 1921. \$4.00

Prof. Laby and Dr. Kaye have attempted to collect the more reliable and recent determinations of some of the important physical and chemical constants, which will be of use to the research worker and student. Many of the tables are prefaced by a brief résumé containing references to such books and original papers as may profitably be consulted for further information. There is a copious index.

**KAYE, G. W. C.** *X-Rays.* An introduction to the study of Röntgen Rays. By G. W. C. Kaye, B.A., D.Sc., Head of the Radium Department at the National Physical Laboratory, Examiner in Medical Physics for the Universities of London and Glasgow, Member of Council of the Röntgen Society. 307 p. 8 vo. il. New edition in preparation.

**KEABLE, B. B.** *Coffee, From Grower to Consumer.* (Pitman's Common Commodities and Industries.) 122 p. il. 12 mo. 1918. \$1.00

CONTENTS: Introduction. The coffee plant; Cultivation; Preparation. The principal coffee-producing countries. Arabia and Abyssinia; Coffee production in the British Empire. Technical terms. Production and consumption. Preparation for the London market; Valuing, Roasting, Blending; The active principle of coffee and its medicinal properties. Coffee adulterants and substitutes. Is there any way of increasing the consumption? Coffee making. Some remarks on the duty, present and past

**KEITT, T. E.** *Chemistry of Farm Practice.* 253 p. 12 mo. il. 1917. \$2.00

**KENDALL, E. C.** *Thyroxin.* American Chemical Society Monograph. In preparation.

**KENT, WILLIAM.** *Bookkeeping and Cost Accounting for Factories.* 261 p. 8 vo. 1918. \$4.00

**KENT, W.** *Mechanical Engineers' Pocket Book.* By William Kent, M.E., Sc.D. Ninth edition, thoroughly revised, with the assistance of Robert Thurston Kent, M.E. 1526 p. 16 mo. il. Flexible "Fabrikoid" binding. 1916. \$7.00

A reference book of rules, tables, data, and formulas for the use of engineers, mechanics, and students. Covers the entire field of mechanical engineering, presenting the information that the engineer in practice needs in his daily work, in condensed, usable form.

**KERSHAW, G. BERTRAM.** *Modern Methods of Sewage Purification.* A guide for the designing and maintenance of sewage purification works. 356 p. 8 vo. il. 1911. \$7.50

This book deals with the subject of sewage purification from the engineering and practical point of view, and describes some of the more efficient methods in use at the present day, while discussing at some length the practical and financial points which require consideration. Special prominence has been given to practical points which are sometimes apt to be overlooked. The book deals mainly with the problems of sewage disposal which arise in towns of moderate size.

CONTENTS: Introduction. Historical. Conservancy methods, etc. Drainage areas. Water supply, etc. Sewage systems, etc. Rainfall, storm water, etc. Variations in flow of sewage, etc. Classification of sewage, etc. Considerations to be observed in selecting the site for sewage disposal works, etc. Preliminary processes. Disposal of sludge. Land treatment of sewage. Contact beds. Percolating filters. Trade wastes. Miscellaneous. Purification works in actual operation.

**KERSHAW, G. B.** *Sewage Purification and Disposal.* By G. B. Kershaw, M.Inst.C.E. 340 p. 12 mo. 1915. \$3.75

**KERSHAW, J. B. C.** *Electrometallurgy.* 303 p. 8 vo. il. 1908. \$2.50

CONTENTS: Aluminum, Bismuth and gold, Calcium carbide and acetylene gas, Carborundum, Copper, Ferro-alloys, Glass and quartz glass, Graphite iron and steel, Lead, Miscellaneous products; Nickel; Sodium, Tin, Zinc

**KERSHAW, J. B. C.** *Electro-Thermal Methods of Iron and Steel Production.* 239 p. 8 vo. il. 1914. \$3.00

**KERSHAW, JOHN B. C.** *Fuel, Water and Gas Analysis For Steam Users.* Second Edition, Revised and Enlarged. 213 p. 8 vo. 1920. \$3.50

CONTENTS: Fuel. Natural and Artificial Fuels. Their Origin, Composition and Methods of Sampling. The Approximate Analysis of Fuel; Preparing the Sample. Testing the Fuel; The Calorific Valuation of Solid Fuels. The Calorific Valuation of Liquid and Gaseous Fuels; The Practical Applications of the Test Results. Water. The Sources of Feed Water Supply and the Physical and Chemical Characteristics of the Same; The Approximate Analysis of Water; The Practical Applications of the Test Results; The Use of Softening Reagents and the Tests Necessary to Regulate Their Amount. Waste Gases. The Chemical and Physical Characteristics of the Waste Gases—Sampling the Gases, The Approximate Analysis of the Waste Gases, The Use of Continuous and Recording Gas-Testing Apparatus; The Practical Applications of the Gas-Test Results; Appendix

**KEYES, F. G., and BROWNLEE, R. B.** *Thermodynamic Properties of Ammonia; computed for the use of engineers.* 73 p. 4 to. 1916. \$1.00

**KIDDER, FRANK EUGENE.** *The Architects' and Builders' Handbook.* A handbook for architects, structural engineers, builders and draughtsmen, by the late Frank E. Kidder, compiled by a staff of specialists. Thomas Nolan, editor-in-chief. Seventeenth edition, revised. 1900 p. 16 mo. il. 1916. \$7.00

Practically a new book—the well-known "Kidder" revised by a staff of experts headed by the professor of architectural construction in the University of Pennsylvania. There are many new illustrations and much up-to-date matter upon the subject of reinforced-concrete mill and factory construction; extended tables of specific gravities and weights of substances; data on architectural acoustics, waterproofing of foundations, the quantity system of estimating, architectural societies of the world, and extended lists of architectural schools.

**KILBOURNE, C. H.** *Pasteurization of Milk; from the practical viewpoint.* 248 p. 12 mo. il. 1916. \$2.25

**KING, HORACE WILLIAMS.** Handbook of Hydraulics for the Solution of Hydraulic problems. 424 p. 12 mo. 1918. \$3.50

A large amount of data, including 112 tables, is closely packed into this little book. It is stated that efforts have been made to simplify calculations and to secure an accuracy consistent with the best experiments. Older and commonly accepted formulas are given preference except where a gain in accuracy or simplicity or both will result from the adoption of new formulas or methods. A knowledge of the fundamental principles of hydraulics is presupposed and derivations have been largely omitted.

**KINGSCOTT, P. C. R., and KNIGHT, R.** Methods of Quantitative Organic Analysis. 283 p. 8 vo. 1914. \$2.50

**KINGZETT, C. P.** Popular Chemical Dictionary. 368 p. 8 vo. 1920. \$4.00

**KINNICUTT, L. P., WINSLOW, C. E. A., and PRATT, R. W.** Sewage Disposal. Second edition. 547 p. 8 vo. il. 1919. \$5.00

**CONTENTS:** Introduction. The sanitary demand for sewage disposal; Composition of sewage. Disposal of sewage by dilution. Screening and straining of sewage. Preliminary treatment of sewage by sedimentation. Preliminary treatment of sewage by chemical precipitation. Preliminary treatment of sewage in two-story tanks. Disposal of sewage by broad irrigation or sewage farming. Disposal of sewage by intermittent filtration through sand. Treatment of sewage in contact beds. Treatment of sewage in trickling or percolating beds. Treatment of sewage by the activated sludge process. Disposal of sewage sludge. Disinfection of sewage and sewage effluents. Some general considerations in regard to the design and operation of sewage treatment plants. Disposal of sewage and excreta wastes in the absence of a sewerage system; Methods of testing sewage and sewage effluents. References.

**KIPPING, F. S., and PERKIN, W. H.** Inorganic Chemistry. 734 p. 12 mo. 1911. \$2.50

**KNECHT, E., RAWSON, CHRISTOPHER, and LOEWENTHAL, RICHARD.** A Manual of Dyeing. Fifth edition, thoroughly revised throughout for the use of practical dyers, manufacturers, students, and all interested in the art of dyeing. 2 volumes. Large 8 vo. 1919. Per set, \$15.00

**CONTENTS:** Vol. I—Introduction. Chemical technology of the textile fibers—Vegetable fibers, animal fibers, artificial fibers. Water—Physical and chemical properties. Water for technical purposes. Purification of water. Washing and bleaching—Cotton. Linen. Hemp. Jute. Wool. Silk. Tussur silk. Acids, alkalis, mordants. Classification of dyers' drugs. Acids and acid mordants. Bases and salts, and basic mordants. Various chemicals. Natural coloring matters—Indigo. Logwood. Fustic. Quercitron bark and flavin. Weld. Persian berries. Young fustic. Turmeric. Safflower. The red woods. Madder. Orchil. Cochineal. Catechu. 371 p. 8 vo. il.

**CONTENTS:** Vol. II—Artificial, organic coloring matters. Abbreviation of names. Direct cotton colors. Sulphide or sulphur colors. Basic colors. Eosins and rhodamines. Resorcin blue. Acid colors. Mordant colors. Acid chrome colors. Miscellaneous colors. Compounds of the aromatic series. Mineral colors. Chrome yellow. Orange and green. Khaki. Manganese brown. Iron buff and Nankin yellow. Prussian blue. Machinery used in dyeing—Dyeing of loose fiber. Dyeing of tops. Foam dyeing. Dyeing of yarn. Dyeing of piece goods. Dissolving of colors. Staining after dyeing. Washing after dyeing. Removal of water by mechanical means. Drying. Experimental dyeing and fastness of dyed colours. Experimental dyeing. Fast and loose colors. Methods of testing. Analysis and valuation of materials used in dyeing. Normal solutions. Indicators. Analysis of alkalies, acids, etc. Aniline oil and aniline salts. Examination and analysis of dyes. Examination of fibers, yarn, and cloth. Identification of dyestuffs on the fiber. A. G. Green's tables for the identification of dyestuffs on the fiber. Appendix. Index. 531 p. 8 vo. il.

**KNECHT, R., and FOTHERGILL, J. B.** Principles and Practice of Textile Printing. 615 p. 8 vo. il. 1913. \$12.50

Radical changes have taken place in the textile printing industry, and the changes chiefly apply to the introduction of new and important processes and, to some extent, to plant and mechanical appliances. New styles have been introduced, of which those in which coloring matters (e.g., insoluble, azo dyes, nitroblue, paramine brown) are produced in the fiber are of paramount importance.

**CONTENTS:** Part I.—Introduction. Part II.—Methods of printing. Part III.—Preparation of the cloth for printing. Part IV.—Preparation of colors for printing. Part V.—Treatment of goods after printing. Part VI.—Mordants, etc. Part VII.—Styles of printing. Part VIII.—Finishing of printed calicoes. Part IX.—Wool printing. Part X.—Silk and half-silk printing. Addenda.

**KNOX, JOSEPH.** The Fixation of Atmospheric Nitrogen. 120 p. 12 mo. il. 1914. \$1.00

**CONTENTS:** Fixation of atmospheric nitrogen as nitric and nitrous acids, or as their salts. Synthesis of ammonia and ammonium compounds from atmospheric nitrogen. Conversion of atmospheric nitrogen into compounds which readily yield ammonia; Bibliography.

**KNOX, JOSEPH.** Physico-chemical Calculations. 190 p. 12 mo. 1912. \$1.50

The book contains eleven chapters, dealing with the main subdivisions of physical chemistry. Each chapter consists of a short introduction dealing with the theory required for the solution of the problems, a series of typical problems with complete solutions, and a list of problems for solution with answers.

**KOBER, GEORGE M., and HANSON, W. C., editors.** Diseases of Occupation and Vocational Hygiene. 918 p. 8 vo. il. 1916. \$8.00

**KOESTER, FRANK.** Hydroelectric Developments and Engineering. A practical and theoretical treatise on the development, design, construction, equipment, and operation of hydroelectric transmission plants. Second edition. 475 p. 4 to. il. 1909. \$6.00

**CONTENTS:** Investigation. Economy in development. Gravity dams. Movable dams. Fish-ways, head race. Trenches. Flumes. Tunnel. Syphon system. Rocks. Screens. Gates. Collecting basin. Steel, wooden and reinforced concrete penstocks. Power plant arrange-

ment. Foundations. Superstructure. Turbines. Draft tubes. Regulating devices. Oiling systems. Testing turbines. Generators. Switching room. Switch boards. Wiring diagrams. Bus bar. Oil switches. Relays. Transmission lines. Strength. Spacing and size of conductors. Transposition. Corona Effect. Wooden and concrete poles. Reinforced concrete poles and towers. Steel towers. Insulators. Wall outlets. Substations. Transformers. Converter. Motor-generator. Frequency changer. Switch gear of substations. Line protection. Choke coils. Horn, multigap and fluid lightning arresters. Description of eight hydroelectric transmission plants, viz. two American, one Mexican, one Norwegian, two German, one Swiss Italian, and one Austro-Hungarian.

**KOLLER, T.** Cosmetics. A handbook of the manufacture, employment and testing of all cosmetic materials and cosmetic specialties. Translated from the German by Charles Salter. Third edition. 262 p. 8 vo. 1920. \$3.50

**CONTENTS:** Purpose, Uses and Ingredients of Cosmetics. Preparation of Perfumes, Chemical and Animal Products Used in the Manufacture of Cosmetics; Oils and Fats Used. General Preparations, Mouth Washes and Tooth Pastes, Preparations for the Hair, Antiseptic Washes and Soaps, Preparations for the Skin, etc.; Testing the Materials Used in Making Cosmetics.

**KOLLER, T.** The Utilization of Waste Products. A treatise on the rational utilization, recovery and treatment of waste products of all kinds. Translated from the German. Third revised and enlarged English edition. 346 p. 8 vo. il. 1915. \$5.00

**CONTENTS:** The Waste of towns. Blood and slaughter house refuse. Fat from waste. Tannery waste; Leather waste. Fur and feather waste; Waste herry. Fish waste. Mother of pearl waste; Vegetable ivory waste. Waste wood. Cork waste. Waste paper and bookbinders' waste. By-products of paper and paper pulp works. Waste produced in the manufacture of parchment paper. Wool waste; Silk waste. Waste waters of cloth factories. Cotton spinners' waste. Jute waste. Utilization of rags. Coloring matters from waste. Residues in the manufacture of aniline dyes; Dyers' waste waters. Waste produced in butter making; Molasses; Waste liquids from sugar works. Fruit. Waste products of the manufacture of starch; Brewers' waste. Wine residues; India rubber and caoutchouc waste; Amber waste. Utilization of turf or peat. Manufactured fuels. Illuminating gas from waste and the by-products of the manufacture of coal gas; By-products in the treatment of coal tar oils; Ammonia recovery. Petroleum residues; By-products in the manufacture of rosin oil. Soapmakers' waste; Alkali waste and the recovery of soda; Sulphur; Salt waste; Gold and silver waste; Platinum residues; Iridium from goldsmiths' sweepings; Metal waste; Tinsplate waste. Calamine slimes; Waste iron. By-products of the manufacture of mineral waters; Industrial earths. Microchaum. Mica waste. Slate waste. Broken porcelain; Earthenware and glass; Utilization of waste glass.

**KOPPE, S. W.** Glycerine. Its introduction, uses and examination. For chemists, perfumers, soapmakers, pharmacists, and explosives technologists. 260 p. 12 mo. il. 1915. \$3.50

**KOPPESCHAAR, E.** Evaporation in the Cane and Beet Sugar Factory. 126 p. 8 vo. il. 1915. \$2.50

A compilation based on standard works of evaporation, but arranged to serve the special requirements of the sugar industry.

**KOZMIN, PETER A.** Flour Milling. A theoretical and practical handbook of flour manufacture for millers, millwrights, flour-milling engineers, and others engaged in the flour-milling industry. Translated from the Russian by M. Falkner and Theodor Fjelstrup. 584 p. 4 to. il. 1917. \$8.50

**CONTENTS:** Historical Outline of Flour Milling. General Ideas of the Raw Materials for Flour Production. Preparation of Grain for Grinding; Grinding the Grain; Grading the Product According to Size; Grading the Product According to Specific Gravity; Accessory Appliances and Mechanisms. Milling Diagrams. Construction of Mill Buildings; The Cost of Erecting and of Working Mills.

It is a singular fact that there is no serious modern work on flour milling in the English language. This work is the result of over twenty years of work and study of the technology of milling in nearly all of the flour producing countries of Europe as well as America, and will prove a practical and theoretical text for operative millers and for milling engineers who construct flour mills or design flour milling machinery. The illustrations, because of their large number and detail, should prove especially helpful.

**KRAEMER, H.** Applied and Economic Botany. By Henry Kraemer, Ph.B., Ph.M., Ph.D., Professor of Pharmacognosy, University of Michigan, College of Pharmacy. Second edition. 822 p. 8 vo. il. 1920. \$6.00

This book has been designed for use in technical and agricultural schools, pharmaceutical and medical colleges, for chemists, food analysts, and for those engaged in the morphological and phylogenetic study of plants. It contains a large amount of practical information concerning medicinal and economic plants.

**KRAEMER, HENRY.** Scientific and Applied Pharmacognosy. 857 p. 8 vo. il. 1920. \$6.00

The second edition of a most complete work on the pharmacognosy of vegetable and animal drugs, giving all the important information, with literature citation. It will help the reader to apply science to practice and to solve a great variety of practical problems.

**CONTENTS:** Introductory. Thallophytes; Schizomycetes, or bacteria; Algae; Fungi; Archegonates; Spermatophytes; Gymnosperms, Angiosperms; Dicotyledons; Animal drugs. Powdered drugs.

**KRAUCH, C.** Chemical Reagents, Their Uses, Methods of Testing for Purity and Commercial Varieties. Translated from the German. Second Edition, Revised and Enlarged, by H. B. Stocks. 375 p. 8 vo. 1919. \$7.00

In this edition all the new reagents, such as dimethylglyoxime, nitron, benzidine, etc., have been introduced and their uses described. Much new matter has been added in connection with the order reagents. Temperatures are given in all cases in degrees centigrade, while the whole of the molecular weights have been recalculated from the International Atomic Weights for 1918.

**KRAUS, CHARLES A.** The Properties of Electrically Conducting Systems. About 400 p. 8 vo. il. (American Chemical Society Monograph.) Ready about November 15, 1921.

**CONTENTS:** (Tentative) Introduction. Mechanism of the conduction process. Relation between the conductance and concentration. The Conductance Function as applied to different solutions. General considerations relating to the Conductance Function in dilute and concentrated solutions. Dilute aqueous solutions. Relation between conductance and viscosity and pressure. Effect of temperature on conductance process. Osmotic phenomena. Mixed solvents. Solubility of non-electrolytes in the presence of electrolytes. Equilibria in mixtures of electrolytes. Results of transference experiments. Nature of the ions in electrolytic solutions. Hypotheses relation to the problem of ionization. Results of experiments with Concentration Cells. General resume of the problem of electrolytic solutions. Conduction process in fused electrolytes. Conduction process in solid electrolytes. Properties of metallic conductors. Evidence relating to the transfer matter in metallic conductors. Conduction process in solutions of the metals in ammonia. Resume of metallic systems.

**KRAYER, PETER J.** The Use and Care of a Balance. 24 p. 12 mo. il. 1913. \$1.00

The author has had fourteen years' experience in making and adjusting analytical weights and ten years' experience in visiting laboratories as an adjuster of balances and weights. He describes the setting up of a new balance, and of testing for zero point, equality of arms and sensitiveness; also how to improve a balance whose adjustment has become imperfect through use. This book should prove to be very useful in laboratories.

**KREMANN, R.** The Application of Physico-chemical Theory to Technical Processes and Manufacturing Methods. Authorized translation by Harold E. Potts, M.Sc. 215 p. 8 vo. il. 1914. \$3.00

**CONTENTS:** The two fundamental laws of the mechanical theory of heat. Reaction velocity and catalysis. Other special applications of the law of mass action. The influence of temperature on the equilibrium constant. Dissociation pressure. Application of the phase rule. Application of the phase rule to solid liquid systems. Transformation phenomena in hydraulic binding agents. Other applications of the phase rule. The distribution law. Reciprocal pairs of salts.

**KUNBERGER, A. F., editor.** Gas Chemists Handbook; compiled by Technical Committee, Sub-Committee on Chemical Tests, 1916, of the American Gas Institute. 1916. \$3.50

**LADENBURG, A.** Lectures on the History of the Development of Chemistry Since the Time of Lavoisier. By Dr. A. Ladenburg, Professor of Chemistry in the University of Breslau. Translated from the second German edition by Leonard Dobbin. xvi+374 p. 8 vo. cloth. 1920. \$1.85

**LAFAR, FRANZ.** Technical Mycology. Translated by Charles T. C. Salter. \$6.00

The utilization of microorganisms in the arts and manufactures. A practical work on fermentation and fermentative processes for the use of brewers and distillers, analysts, technical and agricultural chemists, pharmacists, and all interested in the industries dependent on fermentation.

**Vol. I. Schizomycetic fermentation.** 312 p. 8 vo. il. 1910. **CONTENTS:** Section I.—General morphology and physiology of the schizomycetes. Section II.—General biology and classification of bacteria. Section III.—Principles of sterilization and pure cultivation. Section IV.—Chromogenic, photogenic, and thermogenic bacteria. Section V.—The heat-resistant bacteria. Their place in nature and their importance in the fermentation and foodstuff industries. Section VI.—Lactic fermentation and allied decompositions. Section VII.—The formation of mucus and allied phenomena of decomposition. Section VIII.—Decomposition of transformations of organic nitrogenous compounds. Section IX.—Oxidizing fermentations.

**Vol. II. Eumycetic fermentation. Index to both volumes.** 558 p. 8 vo. il. 1911. \$8.00

**CONTENTS:** Section X. Rudiments of general morphology and physiology of the eumycetes. Section XI.—Fermentation by yeasts. Section XII.—Form, structure, and chemical composition of the yeast cell. Section XIII.—Yeast nutrition and yeast culture. Section XIV.—Life history and variability of the saccharomycetes. Classification of the saccharomycetes and schizosaccharomycetes. Section XV.—Morphology, physiology, and classification of certain technically important higher ascomycetes and allied forms. Section XVI.—General morphology, physiology, and classification of technically important budding fungi of the group "Fungi Imperfecti." Section XVII.—The exzymes and enzyme actions of yeast.

**LAKE, E. F.** Composition and Heat Treatment of Steel. 252 p. 8 vo. il. 1911. \$3.00

**CONTENTS:** Making of pig iron; Bessemer process; Electric furnace; Open hearth process; Crucible process; Ingredients and materials; Working steel into shape. Furnaces and fuel for heat treatment; Annealing. Hardening. Tempering; Carbonizing; Index.

**LAKE, P. and RASTALL, R. H.** A Textbook of Geology. Third edition. 528 p. 8 vo. il. 1920. \$7.50

**CONTENTS:** Introductory. Denudation. Rivers. Earth sculpture. Terrestrial deposits. Snow and ice as agents of denudation. Marine denudation. Marine deposits. Sedimentary rocks. Lakes. Earth movements. Volcanicity. Igneous rocks; Metamorphism. Ore deposits and mineral veins. Principles of stratigraphy; Pre-Cambrian or Archean rocks; Cambrian system, Ordovician system; Silurian system; Devonian or Old Red Sandstone system; Carboniferous system; Permian system; The Trias or Triassic system; Jurassic system; Cretaceous system; Eocene and Oligocene series; Miocene and Pliocene series; Pleistocene series; Geological history of the British Isles; History of igneous activity in the British Isles.

**LAMBERT, THOMAS.** Bone Products and Manures; an account of the most recent improvements in the manufacture of fat, glue, animal charcoal, gelatin and manures. 1262 p. 8 vo. 1913. \$3.50

**CONTENTS:** Bones and Their Products; Glue; Gelatine; Uses of Glue, Gelatine and Size in Various Trades; Soils and Plant Life; Natural Manures; Artificial Manures; Mineral and Other Manures; Analysis of Raw and Finished Products; Tables.

**LAMBERT, THOMAS.** Glue, Gelatine, and Their Allied Products. A practical hand-book for the manufacture, agriculturist and student of geology. 155 p. 8 vo. il. 1905. \$3.00

**CONTENTS:** Historical. Properties of glue and gelatine. Installation of works. Glue. Gelatine. Size and Isinglass. Treatment of effluents produced in glue and gelatine making. Liquid and other glues, cements, etc. Uses of glue and gelatine. Residual products from glue and gelatine. Analyses of raw and finished products. Appendix. Tables. Index.

**LAMBERT, T.** Lead and Its Compounds. 226 p. 8 vo. il. 1902. \$3.50

**CONTENTS:** History; Distribution; Composition of lead; Dressing of lead ores. Smelting of lead ores. Condensation of lead fume; Deal-ization; Lead pipes and sheets; Litharge and massicot; Lead poisoning; Lead substitutes; Zinc and its compounds; Puncer stone; Drying oils and siccatives; Classification by color of mineral pigments; Analysis of raw and finished products.

**LAMBORN, L. I.** Cotton Seed Products. 253 p. 8 vo. 1916. \$4.00

**LAMBORN, L. I.** Modern Soaps, Candles, and Glycerin. A practical manual of modern methods of utilization of fats and oils in the manufacture of soaps and candles, and the recovery of glycerin. 688 p. 8 vo. il. 1918. \$10.00

**CONTENTS:** The soap industry. Raw materials of soap making; Bleaching and purification of soap stock; Chemical characteristics. Mechanical equipment of a factory; Cold process and semi-boiled soap; Grained soap; Settled rosin soap. Milled soap base; Floating soap. Shaving soaps; Medicated soap; Essential oils and soap perfumery; Milled soap; Candles; Glycerin; Examination of raw materials and factory products.

**LANDOLT, H.** The Optical Rotating Power of Organic Substances and Its Practical Applications. By Dr. Hans Landolt, Professor of Chemistry in the University of Berlin. Second edition. Authorized English translation. 75 pp. 8 vo. il. 1902. \$7.50

**CONTENTS:** Part First—General conditions of optical activity. Part Second—Physical laws of circular polarization. Part Third—Numerical values for the rotating power. Specific rotation. Part Fourth—Apparatus and methods for the determination of the specific rotation. Part Fifth—Practical applications of optical rotation. Part Sixth—Constants of rotation of active bodies.

**LANE-CLAYTON, JANET E.** Milk and Its Hygienic Relations. 356 p. 8 vo. 1916. \$3.25

**LANGBEIN, GEORGE.** Electro-deposition of Metals. Translated, with additions by William T. Brannet. Eighth edition, revised and enlarged. 863 p. 8 vo. 185 il. 1920. \$7.50

A practical, comprehensive work, comprising electroplating, galvanoplastic operations and electrolytic deposition of metals by the contact and immersion processes, coloring of metals, lacquering, methods of grinding and polishing, and hundreds of tested formulae and trade secrets, as well as descriptions and applications of voltaic cells, dynamo electric machines and plating shop equipment. A complete exposition of all materials and processes used in every department of the art.

**LANGE, K. R.** By-Products of Coal-Gas Manufacture. Translated by Charles Salter. 162 p. 12 mo. 1915. \$2.50

**CONTENTS:** Production of Coal Gas; Coke; Retort Graphite; Gas Tar; The Gas Liquor; Treatment of the Gas Purifying Agents. Treatment of the Cyanogen Sludge; Treating the Crude Liquors; Treatment of the Crude Ammonium Thiocyanate and Cuprous Thiocyanate; Potassium Ferricyanide; The Cyanogen Pigments; Sulphur and Sulphuric Acid.

**LASCELLES, T. W.** Engraving. (Pitman's Common Commodities and Industries.) 118 p. il. 12 mo. 1920. \$1.00

**CONTENTS:** A sketch of the history of engraving; Line engraving. The preparation of wood for wood engraving. Wood engraving; Etching; Mezzotint engraving. Dry point etching. Monotypes. Proofing wood engraving. Copper-plate printing or proofing; Engravers' studio. Steel facing.

**LASSAR-COHN, E.** An Introduction to Modern Scientific Chemistry. Translated from the second German edition by M. M. Pattison Muir. New edition. 358 p. 12 mo. 1908. \$2.25

**CONTENTS:** List of the Elements; Hydrogen Gas; Chlorine, Bromine, Iodine, Fluorine, and Their Compounds with Hydrogen, Hydrochloric Acid Gas; Acids, Bases and Salts; Halobromic, Hydriodic and Hydrofluoric Acid; Atoms and Their Weights; Calculating Formula from the Results of Analyses; Molecules and Their Weights; Oxygen, Sulphur, Sulphuric Acid; Acid Salts; Double Salts; Basic Salts; Nitrogen; Nitric Acid; Aqua Regia; Explosives; Phosphorus. Various Modifications of Certain Elements; Ozone; Phosphoretted Hydrogen; Building up of Plants from Inorganic Substances; Arsenic; Antimony; Carbon. Organic Chemistry; Valencies of the Elements; Chemistry of Organized Substances; Asymmetric Carbon Atom; Manufacture of Coal Gas; Acetylene Gas, Petroleum; Flame; Silicon; The Metals; The Light Metals; Preparation of the Light Metals by Electricity; Potassium; Sodium; Calcium; Magnesium; Aluminum; The Systematic Arrangements of the Elements.

**LASSAR-COHN, E.** Application of Some General Reactions to Investigations in Organic Chemistry. Authorized translation by J. Bishop Tingle, Professor of Chemistry in the McMaster University, Toronto. 101 p. 12 mo. 1904. \$1.25

The book deals with the fundamental principles and generalizations underlying organic chemistry.

**LASSAR-COHN, E.** Chemistry in Daily Life. Translated by M. M. Pattison Muir, M.A. Fifth edition, revised and augmented. 318 p. 12 mo. il. 1916. \$2.50

This book embodies a course of lectures delivered by the author and shows that chemical phenomena are intimately bound up with our daily lives.

**CONTENTS:** Breathing. Nature of flame. Food of plants. Mixed diet. Quantity of food that must be consumed, and nutritive values of the chief foods. Wine vinegar. Tanning. Oil painting. Potash. Glass. Noble and base metals. Alloys. Alkaloids. Index.

**LATTA, NISBET.** American Producer Gas Practice and Industrial Gas Engineering. 547 p. 8 vo. 1910. \$6.00

**Contents:** Producer operation; The producer; Cleaning the gas; Works details; Producer types; Moving gases; Solid fuels; Physical properties of gases; Chemical properties of gases; Gas analysis; Gas power; Gas engines; Furnaces and kilns; Burning lime and cement; Preheating air; Doherty combustion economizer; Combustion in furnaces; Temperature, radiation and conduction; Data; Heat measurement; Flues and chimneys; Materials; Useful tables; Glossary.

A manual in simple language, of producer gas engineering practice, as applied to everyday operations upon a practical and commercial basis, omitting any theorizing and laboratory results unsuitable to commercial and manufacturing conditions. Readable alike to the engineer, operator and promoter.

**LAUCKS, I. F.** Commercial Oils, Vegetable and Animal, with Special Reference to Oriental Oils. 148 p. 16 mo. 1919. \$1.50

This book is intended for the non-technical man in the oil trade.

**LAW, EDWARD F.** Alloys and Their Industrial Application. Second edition. 332 p. 12 mo. il. 1909. \$5.00

This volume summarizes the existing state of our knowledge of mixed metals, paying special attention to the general principles and essential facts, while omitting all the unimportant details, and secondly, applies that knowledge to the industrial alloys in every day use.

**Contents:** Introduction. Properties of alloys. Methods of investigation. Constitution. Influence of temperature on properties. Corrosion of alloys. Copper alloys (bronzes). Copper alloys (brasses). Copper alloys (special bronzes and brasses). German silver and miscellaneous copper alloys. White metal alloys, lead, tin, and antimony. Antifriction alloys. Aluminum alloys. Silver and gold alloys. Iron alloys. Miscellaneous alloys. Index.

**LAZELL, E. W.** Hydrated Lime. 95 p. 8 vo. 1915. \$0.60

**LEACH, A. E., and WINTON, A. L.** Food Inspection and Analysis. 1090 p. 8 vo. il. 1920. \$8.50

**Contents:** Food analysis and official control. The laboratory and its equipment. Food, its functions, proximate components, and nutritive value. General analytical methods. The microscope in food analysis. The refractometer. Milk and milk products. Fish foods. Eggs. Cereals and their products, legumes, vegetables and fruits. Tea, coffee and cocoa. Spices. Edible oils and fats. Sugars and saccharine products. Alcoholic beverages. Vinegar. Artificial food colors. Food preservatives. Artificial sweeteners. Flavoring extracts and their substitutes. Vegetable and fruit products. Determination of Acidity by means of the hydrogen electrode. Appendix. The Food and Drugs Act. The Meat Inspection Law. Photomicrographs of pure and adulterated foods and of food adulterants. Minimum percentages of alcohol in wines corresponding to Walphen ratios.

**LEAVENWORTH, WM. STOWELL.** Inorganic Qualitative Chemical Analysis. 153 p. 8 vo. 1906. \$1.50

**Contents:** Groups of the metals; Reactions of the metals. Reactions of the acids; Analysis of the acids. Examination of the dry acid salts. Preparation of the solution. Groups of the acids. Analysis of the acids in solution; Detection of the halogens; Detection of nitric acid. Examination of the solids; Solution of solids; Complete analysis of all the groups; Spectrum analysis of Groups V and VI. The reactions of the rare elements; The reagents; The list of apparatus. The table of the elements. The table of solubilities.

**LE BAS, GERVAISE.** Molecular Volumes of Liquid Chemical Compounds. 287 p. 8 vo. 1915. \$3.00

**LE BLANC, MAX.** The Production of Chromium and Its Compounds by the Aid of the Electric Current. By Dr. Max Le Blanc, Professor and Director of the Physical Chemical (Electrochemical) Institute of the Technical High School, Karlsruhe. 122 p. 8 vo., 1904. \$1.50

**Contents:** I.—Obtaining of metallic chromium. (A) By electrolysis of aqueous solutions. (B) By the use of high temperatures. II.—The obtaining of compounds of chromium with metals. (A) By electrolysis of aqueous solutions. (B) By the use of high temperatures. III.—Obtaining of the compounds of chromium with the non-metals. (A) Carbon compounds. (B) Silicon compounds. (C) Phosphorus compounds. (D) Sulphur compounds. (E) Oxygen compounds. Appendix.

**LEEDS, F. H., and BUTTERFIELD, W. J. A.** Acetylene: the principles of its generation and use. Second edition, revised and enlarged. 396 p. 8 vo. il. 1910. \$3.25

**Contents:** Introductory. The cost and advantages of acetylene lighting. The physics and chemistry of the reaction between carbide and water. The general principles of acetylene generation—acetylene generating apparatus. The selection of an acetylene generator. The treatment of acetylene after generation. The chemical and physical properties of acetylene. Mains and service pipes—subsidiary apparatus. Combustion of acetylene in luminous burners—their disposition. In incandescent burners—heating apparatus, motors, autogenous soldering. Carburized acetylene. Compressed and dissolved acetylene mixture with other gases. Sundry uses. Portable acetylene lamps and plant. Valuation and analysis of carbide. Descriptions of generators. Index.

**LEHNER, S.** Ink Manufacture. Including writing, copying, lithographic, marking, stamping and laundry inks. Translated from the German of the fifth edition by A. Morris and H. Robson. 174 p. 8 vo. il. 1914. \$2.50

**Contents:** Varieties of ink; Writing inks; Raw materials of tannin inks; Chemical constitution of the tannin inks; Recipes for tannin inks; Logwood tannin inks; Ferric inks; Alizarine; Extract, logwood copying inks; Hektograph and safety inks; Ink extracts and powders; Preserving inks; Changes in ink and the restoration of faded writings; Colored inks—red, blue, violet, yellow, green, metallic and Indian; Lithographic inks and pencils; Ink pencils; Marking inks; Ink specialties; Sympathetic inks; Stamping inks; Laundry or washing blue.

**LEIGHOU, ROBERT B.** Chemistry of Materials of the Machine and Building Industries. 449 p. 8 vo. 75 il. 1917. \$3.50

The chemical properties of the materials employed in the various branches of building construction and equipment, and in machinery construction and operation, are covered clearly from the point of view of the user.

**Contents:** Preface. Water for steam generation; Fuels; Refractory materials for furnaces; Iron and steel; The corrosion of iron and

steel; The non-ferrous metals. The non-ferrous alloys; Foundry sands; Building stones; Lime and gypsum products; Portland cement; Clay and clay products; Paints, varnishes, stains and fillers; Lubricants; Glues; Rubber; electrical insulating materials; Primary electric cells; Secondary cells; Hydrometry.

**LEVY, DONALD M.** Modern Copper Smelting. Being lectures delivered at Birmingham University greatly extended and adapted, and with an introduction on the history, uses and properties of copper. 259 p. 8 vo. il. 1912. \$4.00

The lectures embodied in this volume are based largely upon the results of a study of the practice as conducted at the best organized smelters and refineries in the United States, at which the author has had the opportunity of spending considerable time. The scope is given in a clear concise way, dealing broadly with the principles underlying the Modern Methods, illustrated with examples of working practice from personal observation. The subject matter of the lectures has been extended by the addition of An Introduction on the History, Uses and General Metallurgy of Copper as Applied to Modern Practice.

**LEVY, S. I.** Modern Explosives. (Pitman's Common Commodities and Industries.) 109 p. 12 mo. il. 1920. \$1.00

**Contents:** Modern explosives and their raw materials; The chemistry of explosives manufacturing; The acid action of an explosive factory; The manufacturing of propellant explosives; Preparation of high explosives; Explosives in war and peace; Chemistry and national welfare.

**LEWES, V. B.** Liquid and Gaseous Fuels and the Part They Play in Modern Power Production. 348 p. 8 vo. il. 1907. \$3.00

**Contents:** Combustion; Formation and Composition of Fuel; Determination of Calorific Value; Liquid Fuels; Use of Liquid Fuels; Liquid and Gaseous Fuels; Manufacture of Coal Gas; Use of Coal Gas for Heating and Power; Water Gas; Poor Fuel Gas; The Fuel of the Future.

**LEWES, V. B.** The Carbonisation of Coal. A scientific review of the formation, composition and destructive distillation of coal for gas, coke and by products. 330 p. 8 vo. il. 1914. \$5.00

**Contents:** The formation, composition, classification, and distribution of coal. Form of retorts used in gas manufacture. Coke ovens and their development. Conditions existing in the destructive distillation of coal. Primary gaseous products of the destructive distillation of coal and the bodies from which it has been formed. Tar; its formation, use and decomposition. Coke. Nitrogen and sulphur of coal, and their recovery. Modern coal gas. Appendix.

The chemical and mechanical principles involved in the destructive distillation of coal are carefully pointed out and the work of various investigators critically presented together with much data gathered from the author's own recent investigations and his attempts to define the probable lines along which future advances in the carbonization of coal may be expected.

**LEWES, V. B., and BRAME, J. S. S.** Service Chemistry; being a short manual of chemistry and metallurgy and their application in the naval and military services. 376 p. 8 vo. 1913. \$6.75

**LEWIS, WILLIAM C. M.** A System of Physical Chemistry. Second edition. 3 vols. 8 vo. 1918-1919. \$11.50

**LIBBY, WALTER.** Introduction to the History of Science. 288 p. 12 mo. 1917. \$1.50

**LIDDELL, DONALD M., comp.** The Metallurgists and Chemists' Handbook; a reference book of tables and data for the student and metallurgist. Second edition, revised and enlarged. 656 p. 16 mo. il. 1918. \$5.00

A compact reference pocketbook of tables and data for the metallurgist and chemist. Six hundred pages, packed with tables, formulae, constants, and similar reference data to supply the fact or figure which you would otherwise spend hours in searching for. Mr. Liddell bases his collection on extensive practical experience as a metallurgist, coupled with the close observation of the requests for information which came to him through a considerable period as managing editor of "The Engineering and Mining Journal." This handbook does not undertake to cover the field of the "General Metallurgy." There are no lengthy discussions of processes or apparatus. Instead are boiled down facts and figures—concise reference data from all sources are made available in a single convenient handbook.

**Section Headings:** Mathematics. Price and production statistics. Physical constants. Chemical data. Sampling; Assaying and analysis. Ore dressing. Cyanidation. Fuels and refractories. Mechanical engineering and construction. General metallurgy. First aid.

**LIDGETT, ALBERT.** Petroleum. (Pitman's Common Commodities and Industries.) 168 p. 12 mo. il. 1919. \$1.00

**Contents:** Petroleum and its origin. The oil fields of the world; How petroleum is produced; The refining of petroleum, Transport by land and sea; Petroleum as fuel, Petroleum as a lighting agent; Internal combustion engines, Petroleum in England, Petroleum in the British Empire; Petroleum's part in the great war; The Scottish shale oil industry; A few notable petroleum enterprises, Statistical.

**LINCOLN, A. T.** Physical Chemistry. By Azariah T. Lincoln, Professor of Physical Chemistry, Rensselaer Polytechnic Institute, Troy, N. Y. 555 p. 12 mo. 1918. \$5.50

This work comprises the fundamental material which serves as the basis for a course in elementary Physical Chemistry. As this information is valuable to all workers in chemistry and as not much mathematics is necessary for a comprehension of the greater part of it, in general the presentation is non-mathematical. Special emphasis is placed upon the accuracy of statement of the fundamental conceptions of chemistry, upon the historical development of certain ideas, as well as upon the industrial application of these principles. The use of the phase rule as a basis of classification and its practical applications have been particularly emphasized, as has also the new and important department of colloid chemistry. Since the principles and their applications can best be emphasized by numerical examples, the fundamental equations have been collected and rearranged, as well as solved for various terms, and there have been included several hundred problems.

**LIND, SAMUEL C.** Chemical Effects of Alpha-Particles and Electrons. 180 p. 8 vo. il. 1921. American Chemical Society Monograph. \$3.00

CONTENTS: Radiochemistry; Brief outline of radioactivity and some properties of the radiations; Electrical effects—ionization, Qualitative radiochemical effects, Chemically quantitative investigations in liquid systems, Reactions produced by radium emanation, Relation between gaseous ionization and radiochemical effects, Kinetics of the chemical reactions produced by radium emanation, Additional relations of the radiochemical effects, Photochemical equivalence law, Positive rays and recoil atoms, Atomic disintegration by alpha particles.

**LINDGREN, W.** Mineral Deposits. By Waldemar Lindgren, William Barton Roger Professor of Economic Geology, in charge of the Department of Geology, Massachusetts Institute of Technology, formerly Geologist of the U. S. Geological Survey. 957 p. 8 vo. il. 1919. \$6.00

A scientific treatment of economic geology. It is a description, by classes and type examples, of the occurrence, structure and origin of the principal deposits of metallic and non-metallic minerals. It is based on the author's broad experience.

**LIPKA, J.** Graphical and Mechanical Computation. By Joseph Lipka, Ph.D., Assistant Professor of Mathematics in the Massachusetts Institute of Technology. 264 p. 8 vo. 1918. \$4.00

**LLOYD, STRAUSS L.** Mining and Manufacture of Fertilizing Materials and Their Relation to Soils. 159 p. 12 mo. il. 1918. \$3.00

CONTENTS: Chemistry of fertilizers, Origin and composition of soils; The relation between soils and fertilizing materials, Fertilizer phosphate ore dressing and milling, Hard rock phosphate ore dressing and milling, Fluorapatite, Artificial manure manufacture, Manufacture of superphosphate, Compound manures, Nitrogenous manures, The fixation of atmospheric nitrogen, Manufacture of cyanamide and nitrate of lime—Experiments with cyanamide, Potassic manures—Manufacture from crude salt, feldspar, sunflower and kelp plants, On the examination of commercial fertilizers and materials; On the examination of soils.

**LOCK, R. H.** Rubber and Rubber Planting. By R. H. Lock, Sc.D. 8 vo. il. 1914. \$1.65

**LOCKHART, L. B.** American Lubricants From the Standpoint of the Consumer. Second edition, revised and enlarged. 8 vo. il. 1920. \$4.00

CONTENTS: Crude petroleum. The refining of petroleum. The refining products. Friction and lubrication. Lubrication of internal combustion engines. Automobile lubrication. The lubrication of electrical machinery. The lubrication of steam cylinders and steam engines. The lubrication of atom railways. The lubrication of cotton mills and other textile mills. The lubrication of miscellaneous plants and machines. Physical methods of testing lubricating oils. Chemical methods of testing lubricating oils. Lubricating greases. Methods for testing and analysis of greases. Animal and vegetable oils. Methods of testing fatty oils. Specifications for fatty oils. Specifications for steam cylinder oils. Specifications for turbine oils. Specifications for cylinder oils for internal combustion engines. Specifications for transmission oils and crankcase oils. Specifications for compressor oils. Specifications for engine oils, paraffin oils and car oils. Specifications for printing oils and light machine oils. Specifications for transformer oil, petroleum residues and miscellaneous oils. Standard government specifications for lubricants. Specifications for cutting oils. Specifications for greases and graphite. Specifications for boiler compounds. Specifications for fuel oil. Specifications for kerosenes. Specifications for gasoline. Gasolines. Kerosene. Tables. Index.

**LOEB, JACQUES.** Forced Movements, Tropisms and Animal Conduct. 209 p. 8 vo. il. 1918. \$2.50

CONTENTS: Introduction. The symmetry relations of the animal body as the starting point for the theory of animal conduct. Forced movements, Galvanotropism; Heliotropism—the influence of one source of light; (1) General facts, (2) direct proof of the muscle tension theory of heliotropism in motile animals, (3) heliotropism of unicellular organisms, (4) heliotropism of sessile animals. An artificial heliotropic machine, Asymmetrical animals. Two sources of light of different intensity; The validity of the Hensen-Kowalev law for the heliotropic reactions of animals and plants. The effect of rapid changes in intensity of light; The relative heliotropic efficiency of light of different wave lengths; Change in the sense of heliotropism; Geotropism, Forced movements caused by moving retina images, Rheotropism, Anemotropism, Stereotropism; Chemotropism, Thermotropism, Instincts, Memory images and tropisms, Literature.

**LONES, T. E.** Zinc and Its Alloys. (Pitman's Common Commodities and Industries.) 127 p. il. 1920. \$1.00

CONTENTS: Zinc—Its history, properties and uses, Zinc ores and other sources of zinc, Dressing zinc ores, Calculating and roasting zinc ores, Zinc smelting, Hydrometallurgical processes; Alloys of zinc.

**LORD, N. W., and DEMOREST, D. J.** Metallurgical Analysis. By Nathaniel W. Lord, late Professor of Metallurgy, Ohio State University. Revised by Dana J. Demorest, Professor of Metallurgy, Ohio State University. International Chemical Series. Fourth edition, revised and enlarged. 342 p. 8 vo. il. 1916. \$3.00

A standard manual that covers practically all the methods of chemical analysis likely to be used by the metallurgical chemist.

CONTENTS: I.—The selection and preparation of samples for analysis, II.—The analysis of limestones, III.—The determination of iron in ores, IV.—The determination of phosphorus in iron ores, iron and steel, V.—The determination of silicon in iron, VI.—The determination of manganese, VII.—The determination of sulfur, VIII.—The determination of carbon in pig iron and steel, IX.—The determination of nickel and cobalt in steel, X.—The determination of vanadium in steel, XI.—The determination of tungsten, chromium and silicon in steel, XII.—The determination of molybdenum in steel, XIII.—The determination of titanium, XIV.—The determination of copper in iron and steel, XV.—The determination of arsenic in iron and steel, XVI.—The determination of aluminum in iron and steel, XVII.—The determination of nitrogen in steel, XVIII.—The determination of oxygen in steel, XIX.—The determination of hydrogen in steel, XX.—The determination of spelter and tin plate coating, XXI.—The determination of zinc in ores, XXII.—The determination of copper in ores, XXIII.—The determination of lead in ores, XXIV.—The de-

termination of tin in ores, XXV.—The analysis of refined copper, XXVI.—The analysis of refined lead, XXVII.—The analysis of bearing metals, XXVIII.—The analysis of spelter, XXIX.—Brass and bronze analysis, XXX.—The analysis of coal and coke, XXXI.—The analysis of gases, XXXII.—The analysis of clays and other materials, XXXIII.—Softening water for boiler use, XXXIV.—Calculation of normal solutions.

**LOUIS, HENRY.** Metallurgy of Tin. 138 p. 8 vo. 1911. \$2.50

**LOVEJOY, ELLIS.** Burning Clay Wares. 232 p. 8 vo. il. 1920. \$5.00

CONTENTS: Clays and their mineral contents, The burning process, Burning behavior of clays, Fuel and combustion, Producer gas, Stacks, Furnaces, Kilns; Some notes on setting, The continuous kiln; Car tunnel kiln, Appendix, Equalization tables.

**LOVEJOY, ELLIS.** Drying Clay Wares. 166 p. 8 vo. il. 1916. \$1.00

**LOW, ALBERT H.** Technical Methods of Ore Analysis. 388 p. 8 vo. 1919. \$3.50

In this eighth edition, a number of new methods for Molybdenum, Potassium, Tungsten and Uranium, which have developed since the last printing, have been added.

**LOW, DAVID ALLAN.** A Pocket-book for Mechanical Engineers. 740 p. 16 mo. il. 1918. \$3.50

**LUCAS, E. W., and STEVENS, H. B.** The Book of Pharmacopias and Unofficial Formularies. 532 p. 12 mo. 1915. \$3.00

**LUCAS, A.** Legal Chemistry and Scientific Investigation. 181 p. 8 vo. 1920. \$3.40

CONTENTS: Introduction. Notes on cases, Alcoholic liquors, Antiquities, Blood stains, Building materials, Bullets, Clothing, Counterfeit coins, Damage to crops, Documents, Dust and dirt, Explosions, Fibres, Firearms, Foods and drugs, Gold and silver, Hashish, Poisons, Robbery, Stains and marks, Staging and rope, Textile fabrics, Tobacco, Traps for criminals, Index.

**LUCKE, C. E.** Engineering Thermodynamics. By Charles Edward Lucke, Ph.D., Professor of Mechanical Engineering, Columbia University. 1176 p. 8 vo. il. 1912. \$8.00

The most comprehensive treatment ever published of the industrial problems dealing with heat, so written as to enable engineers, drafts men and managers to get a numerical answer to the everyday problems of design and performance of heating, refrigerating and power apparatus.

**LUCKE, C. E., and FLATHER, J. J.** A Textbook of Engineering Thermodynamics. An abridgement of Engineering Thermodynamics. By Charles Edward Lucke, Ph.D., Professor of Mechanical Engineering in Columbia University and John J. Flather, Ph.D., M.M.E., Professor of Mechanical Engineering in the University of Minnesota. 688 p. 8 vo. il. 1915. \$5.00

**LUCKIESH, M.** Color and Its Applications. 431 p. 8 vo. il. Second edition, enlarged. \$4.00

(Author is physicist with the Nela Research Laboratory National Lamp Works of the General Electric Co.)

A treatise of the subject of color from the underlying scientific principles to the many applications. The object has been not only to discuss the many applications of color, but to establish a sound scientific basis for these applications. The early chapters are devoted to a discussion of light in relation to color and of the Production, Measurements and Analysis of color. Considerable attention is given to the relation of color and vision, the physiological and psychological phenomena of vision being of great importance in every application of color. The later chapters are devoted to the many applications of color. The book is authoritative, well illustrated, and contains many references and a wealth of new material. It was written by an investigator in the general field of color and is therefore not narrowly limited in scope. It fills a distinct gap that has existed on the book shelves.

CONTENTS: Light, The Production of Color; Color-Mixture, Color Terminology, The Analysis of Color, Color and Vision, The Effect of Environment on Color, Theories of Color Vision, Color Photography, Color in Lighting, Color Effects for the Stage and Displays, Color Phenomena in Painting; Color Matching; The Art of Mobile Color; Colored Media.

**LUNGE, GEORGE.** Coal-tar and Ammonia. Fifth thoroughly revised and enlarged edition. In three volumes, not sold separately. 1600 p. 8 vo. il. 1916. \$25.00

ABRIDGED CONTENTS: Coal-tar. Introductory; Processes for obtaining coal-tar. The properties of coal-tar and its constituents; The applications of coal-tar without distillation; The first distillation of coal-tar; Pitch, Anthracene oil, Creosote oil; Carbolie oil (middle oil); Light oil, Working up the light naphtha into final products. Ammonia. Historical notes on ammonia; Sources from which ammonia is obtained. The composition and analysis of ammoniacal liquor, and properties of its constituents. The working up of ammoniacal liquor into concentrated liquor and liquid ammonia; Manufacture of sulphate of ammonia; Other technically important ammonium salts.

This new edition will be of great importance, as six years have elapsed since the publication of the fourth edition, which has been out of print for some time. In preparing the revised issue the author is not only embodying in it all the new matter collected by himself on visits to factories and through communications with private sources, but also that which he has found in the books and periodicals published in the various industrial countries, and in the extremely numerous specifications of those countries.

**LUNGE, GEORGE.** Technical Chemists' Handbook. Tables and methods of analysis for manufacturers of inorganic chemical products. Second edition, revised. 280 p. 8 vo. 1917. \$4.00

CONTENTS: General tables; Fuel and furnaces, sulphuric acid manufacture, saltcake and hydrochloric acid; Bleaching powder and chloride of potash manufacture; Soda ash manufacture by the Leblanc process; Manufacture of soda by the ammonia process; Caustic soda;



**Electrolytic alkaline liquors; Nitric acid manufacture. Potassium salts; Ammonia manufacture; Coal-gas manufacture. Calcium carbide and acetylene; Examination of the raw materials and products of the manufacture of fertilizers; Alumina preparations; Cement industry. Preparation of standard solutions; Rules for sampling. Comparison of the hydrometer degrees according to Baumé and Twaddell, with the specific gravities. Value of alkali per ton.**

In this edition all analytical factors have been recalculated on the basis of the atomic weights published by the International Committee for 1916. This has involved numerous changes, many of them of importance even for merely practical purposes. The tables of specific gravities and other tables have been selected from among the most recent reliable determinations.

**LUNGE, GEORGE. Technical Gas Analysis.** 422 p. 8 vo. il. 1914. \$4.50

**CONTENTS:** General Remarks on Technical Gas Sampling, Measurement of Gases, Measuring Apparatus, Adjustment or Calibration of Gas Measuring Apparatus; Measuring in Gas Meters, Various Apparatus for Gas Analysis, Methods Employed in Technical Gas Analysis; Estimation of Solid and Liquid Mixtures in Gases, Estimation of Gases by Absorption: (a) by gas volumetric methods, (b) by titration, (c) by weight; Estimation of Gases by Combustion, Gas Analysis by Optical and Acoustical Methods, Separation of Gases by Low Temperatures; Estimation of the Specific Gravity of Gases, Measurement of Pressure and of Draught; Determination of the Calorific Value and Illuminating Power of Gases, Special Methods for Detecting and Estimating Various Gases and Vapors Occurring in Technical Operations, Analysis of Gaseous Mixtures Produced on a Large Scale, Compressed and Liquefied Gases, Gas Volumetric Analysis, Appendix, Tables.

A comprehensive and generally useful work for chemists working on gas analysis. The work of other investigators is quoted only where it would be helpful toward a better use of the book, and for this reason the author does not attempt to mention everything published on the subject. This book superseding, as it does, Winkler and Lunge's previous work, is not based on the former, and is in reality an entirely new treatise.

**LUNGE, GEORGE. The Manufacture of Sulphuric Acid and Alkali.** With the collateral branches. A theoretical and practical treatise. In four volumes. (Three now ready.)

Vol. I, Sulphuric Acid. In three parts. Not sold separately. Fourth edition. 1665 p. 8 vo. il. 1913. Reprinting

**CONTENTS:** Historical and general notes on the manufacture of sulphuric acid. Raw materials of the sulphuric acid manufacture, including nitric acid, Properties and analysis of the technically employed oxides and acids of sulphur, Production of sulphur dioxide, Construction of the lead chambers, Recovery of the nitrogen compounds, Chamber process, Purification of sulphuric acid, Concentration of sulphuric acid, Sulphuric acid works arrangement on the chamber process, Yields and costs, Manufacture of Nordhausen or fuming oil of vitriol, and of sulphuric anhydride, Other processes for manufacturing sulphuric acid, By-products of the manufacture of sulphuric acid, Application of sulphuric acid and statistics, Addenda.

**Sulphuric and Nitric Acid, Supplement to Vol. I.** Fourth edition. 347 p. 8 vo. il. Reprinting

Since the issue of the fourth edition very numerous contributions have been made to the industries described, and in response to numerous requests this material has been compiled and brought up to date in this supplemental volume. The text arrangement is in the form of references to the large book, giving the number of the page in the subject matter which needed changing or amplification.

Vol. II, Sulphate of Soda, Hydrochloric Acid, Leblanc Soda. Third edition, much enlarged. In two parts, not sold separately. 1044 p. 8 vo. il. Reprinting

**CONTENTS:** Properties and occurrences in nature of the raw materials and products of the alkali industry and their analysis, Manufacture of sulphate of soda from salt and sulphuric acid by the process of Hargreaves and Robinson, Other methods; Purification of sodium sulphate; The condensation of the hydrochloric acid produced in the manufacture of sulphates of soda; Manufacture of hydrochloric acid by other than ordinary methods; Wack acid, Control of condensation, Yields, costs, purification, pumping and conveyance of hydrochloric acid; Notes on alkali, Manufacture, Theory of the Leblanc process, The manufacture of black ash; Black ash and tank liquor, Manufacture of finished soda and bicarbonate; Yield and costs, Caustic soda; Tank waste.

Vol. III, Ammonia-Soda, Various Processes of Alkali Making and the Chlorine Industry. Third edition, much enlarged. 784 p. 8 vo. il. 1917. Reprinting

**CONTENTS:** The ammonia-soda process, Historical and general, The ammoniacal solution of salt, The production of carbonic acid for the ammonia-soda process, Precipitation of sodium bicarbonate by the carbonating process, Filtering, drying and cleaning the bicarbonate, Recovery of the ammonia, Combination of the apparatus, final products, costs, statistics, Other forms of the ammonia-soda process, Manufacture of commercial bicarbonate by the ammonia-soda process, Various processes of the alkali manufacture, Manufacture of soda from cryolite; Directly from sodium chloride; from sodium sulphate, without previous reductions to sulphide; from sodium sulphate after reduction to sulphide; from nitrate of soda and feldspar, The chlorine industry, General notes on chlorine, Manufacture of chlorine by manganese ore, Utilization of still liquor, Original Weldon process, The Deacon process, Other processes for the manufacture of chlorine, Properties and behavior of the hypochlorites and of bleaching powder, Manufacture of bleaching powder, Bleach-liquors and other bleaching compounds, The chlorates, Appendix of statistical data.

Vol. IV, Electrolytic Methods. Edited by Professors Askenazy and Haber. Reprinting

**LUNGE, GEORGE. Technical Methods of Chemical Analysis.** English translation from the latest German edition, edited by Charles Alexander Keane, with the collaboration of eminent specialists. In three volumes. (Six parts.) 1908-1914. Reprinting

Vol. I. (In two parts.) 1024 p. 8 vo. il. **CONTENTS:** Technical gas analysis; Fuel analysis; Sulphurous acid, nitric acid and sulphuric acid; Saltcake and hydrochloric acid; Sodium carbonate; The chlorine industry; Potassium salts; Cyanogen compounds; Clay; Clay wares, earthenware and glazes; Aluminum salts and

alumina; Glass; Calcareous cements; Drinking water and water supplies; Feed water for boilers and water for other technical purposes; Sewage and effluents, Soils, Air.

Vol. II. (In two parts.) 1204 p. 8 vo. il.

**CONTENTS:** Iron, Metals other than iron, and metallic salts, Artificial manures, Feeding stuffs, Explosives, Matches and fireworks, Calcium carbide and acetylene, Illuminating gas and ammonia, Coal tar, Organic dyes.

Vol. III. (In two parts.) 1174 p. 8 vo. il.

**CONTENTS:** Mineral oils, Lubricants, Oils, fats and waxes, Special methods of analysis employed in the oil and fat industries, Resins, balsams, and gums-resins, Drugs and galenic preparations, Essential oils; Tartaric acid, Citric acid, Organic preparations, India rubber and rubber goods, Vegetable tanning materials, Leather, Ink, Sugar, Starch and dextrin, Alcohol, potable spirits, and liquors, Vinegar, Wine, Brewing materials and beer; Paper; Textile fibres, Inorganic colors.

**LUPKE, ROBERT. The Elements of Electro-Chemistry.** Translated by M. M. Pattison Muir, M. A. Second edition, revised and enlarged. 255 p. 12 mo. il. 1904. \$2.50

**CONTENTS:** Introduction, Part I. Recent theories of electrolysis, The phenomena of electrolysis, Faraday's law, Historical transport numbers, The law of Kohlrausch, The dissociation theory of Arrhenius.

Part II - The theory of solutions of Van't Hoff, Osmotic pressure, The vapor pressures of solutions, Boiling points and freezing points of solutions, Summary, Aqueous solutions of electrolytes.

Part III - The osmotic theory of the current of galvanic cells, Liquid cells, Daniell cells, Reduction cells and oxidation cells, The solution pressures of the metals, Intensity of fixation, and polarization, Irreversible cells, Accumulators, The energetics of galvanic elements, Index.

**LYNDON, L. Hydro-Electric Power.** By Lamar Lyndon, author of "Storage Battery Engineering." In two volumes. 1916.

Vol. I, Hydraulic Development and Equipment. 408 p. 8 vo. il. \$5.00

Vol. II, Electrical Equipment and Transmission. 360 p. 8 vo. il. \$4.00

This work is designed to meet the needs of engineers engaged in water power development. It covers both the hydraulic and the electrical sides of hydro-electric plant design. Every part of the plant that the practicing engineer is expected to design can be designed from the information it contains.

**MACOMBER, WILLIAM. Engineers' Handbook on Patents.** 288 p. 16 mo. 1913. \$2.50

**CONTENTS:** Introductory; What is a patent?; The nature of invention; What is patentable, Patentable novelty; Obtaining of patents; Claim construction; Infringement; Patent litigation; Property rights; Index.

**MACDONALD, G. W. Historical Papers on Modern Explosives.** With an introduction by Sir Andrew Noble. 200 p. 8 vo. il. 1912. \$2.75

**CONTENTS:** Howard's discovery of fulminate of mercury; Reaccon's discovery of nitrostarch; Schonbein's discovery of gun cotton; Gun cotton in France, Scotland and England; The patents of Schonbein, Tonkin, and Abel, Letters from Berzelius, Hall and Schonbein on gun cotton; The British Association Committee on gun cotton; The manufacture of gun cotton in Austria and at Waltham Abbey; Abel's work on gun cotton; Sobrero's discovery of nitroglycerin; Nitroglycerin in Holland and England; Nobel's patents for the manufacture of nitroglycerin, dynamite, straight dynamite, blasting gelatine and gelignite and ballistite; The analysis and composition of nitroglycerin, The decomposition of nitroglycerin by caustic potash; Certain chemical decomposition of nitroglycerin.

**MACDOUGALL, FRANK H., Ph.D. Thermodynamics and Chemistry.** 391 p. 8 vo. 52 figures. 1921. \$5.50

This book gives the working knowledge of thermodynamics which is needed by all physical chemists and all teachers of chemistry. The treatment is comprehensive, logical, accurate and clear, the applications being discussed very fully. Many examples are given, so that the reader can easily apply results in any particular case.

**CONTENTS:** Temperature; Actual gases, Heat, The first law of thermodynamics; Applications of the first law, I, Applications of the first law - II; Thermochemistry, The second law of thermodynamics; Deductions from the first and second laws, Thermodynamic functions and thermodynamic equilibrium, Fusion, evaporation and sublimation, The phase rule, Applications of the phase rule, I, Applications of the phase rule, II, Applications of the phase rule, III, Chemical equilibrium, Electromotive force, Surface tension and absorption, Radiation, Quantum theory; Nernst heat theorem.

**McFARLAND, D. F., and HARDER, O. E. Preliminary Study of the Alloys of Chromium, Copper and Nickel.** 60 p. 8 vo. 1916. \$0.30

**MacFARLANE, W. Laboratory Notes on Iron and Steel Analyses.** By Walter MacFarlane, F.I.C., Principal of the Metallurgical Department, Staffordshire Education Committee. 478 p. 12 mo. il. 1909. \$3.25

**MacFARREN, H. W. Text Book of Cyanide Practice.** 201 p. 8 vo. 1912. \$3.00

**CONTENTS:** History and development, Nature and properties of cyanides, Dissolution of gold and silver, Suitability of an ore for cyanidation and interfering substances, Chemistry of cyanide solutions, Alkalinity and lime, Ore testing and physical determinations, Percolation, Slime treatment and agitation, Decantation, Filtration, Precipitation, Cleaning up, Roasting and acid treatment, Fluxing and melting, Cyanidation of concentrate, Roasting ore for cyanidation, Cyanide poisoning, Classified bibliography, Tables.

**McHALE, C. F. Commercial Spanish.** By Carlos F. McHale, Spanish Instructor in the National City Bank of New York. 330 p. 12 mo. 1918. \$1.40

By virtue of its clear exposition of commercial procedure, its careful definitions of commercial terms, and its wealth of useful idioms, this book should appeal to students seeking a business training as well as to those primarily interested in learning Spanish. Additional valuable features are the many reproductions of commercial documents, a good index, and the Spanish-English and English-Spanish vocabularies.

**MacINTIRE, H. J.** Mechanical Refrigeration. A treatise for technical students and engineers. By H. J. MacIntire, M.M.E., Assistant Professor of Mechanical Engineering, University of Washington. 346 p. 8 vo. il. 1913. \$4.00

A thorough discussion of insulating material, properties of refrigerants, and heat transmission.

**McINTOSH, J. G.** Industrial Alcohol. The production and use of alcohol for industrial purposes, and as a source of motive power. 460 p. 8 vo. il. 1907. \$3.50

CONTENTS: Alcohol and Its Properties, Continuous Aseptic and Antiseptic Fermentation and Sterilization in Industrial Alcohol Manufacture; Manufacture of Industrial Alcohol from Beets, Grain, Potatoes; Wine, Spiced Wine, Wine Marcs and Fruits, Sugar Cane and Sugar Cane Molasses; Plant for Manufacturing Alcohol, Uses of Alcohol in Industries, Manufacture and Uses of Various Alcohol Derivatives; Alcohol for Lighting, Heating and Motive Power.

**McINTOSH, J. G.** Manufacture of Varnishes and Kindred Industries. Based on and including the "Drying Oils and Varnishes," of Ach. Ivachic. (In three volumes.)

Vol. I. Oil Crushing, Refining and Boiling, Manufacture of Linoleum, Printing and Lithographic Inks, and India Rubber Substitutes. Fourth greatly enlarged English edition. 8 vo. il. \$7.00

CONTENTS: Oil crushing and refining; Theory and practice of oil boiling, Linoleum manufacture, Manufacture of printing inks; Rubber substitutes; Manufacture of driers; Detection by various methods of adulteration in linseed and other drying oils.

Vol. II. Varnish Materials and Oil Varnish Making. 216 p. 8 vo. il. 1920. \$5.00

CONTENTS: Amber and amber oil varnishes; Asphaltum, Coal tar, bone and stearine pitch, India rubber; Gutta percha, Paraffin wax; Cleaning, assorting and fusing resins; Oil varnish making, Copal oil varnishes; Kauri copal varnishes, Brunswick black, Super black japan; Testing varnish. Utilization of residues; Utilization of varnish makers' waste products.

Vol. III. Spirit Varnishes and Spirit Varnish Materials. 402 p. 8 vo. il. 1920. \$6.00

CONTENTS: Solvents. Characteristics of spirit varnish solvents. Source, preparation, and use of various solvents. Alcohol, ether, and ethereal salts, oleo-resinous pine products, turpentine camphors. The oleo-resiniferous conifers. Sources and methods of obtaining turpentine. Distillation of turpentine. Testing and substitutes, distillation and chemistry of resin. Rosin spirit, rosin oil. Chemistry of the terpenes. Wood tar, wood turpentine, wood creosote, etc. Spirit varnish resins and coloring matters. Benzoin, Dammar, kauri, etc. Dragons' blood, Japanese, Chinese and Burmese lacquers. Manila copal. Shellac. Colors and stains. Methods of manufacture. Principles of spirit varnish manufacture. Amber and asphaltum, colloidon, and celluloid spirit varnishes. Copal spirit varnishes, Dammar spirit varnishes. India rubber insulating, mastic, and mastic spirit varnishes. Rosin spirit varnishes. Spirit varnishes analysis and testing. Technical valuation. The determination of the resins and solvents in spirit varnishes.

**McINTOSH, JOHN G.** The Technology of Sugar. Third edition, revised and enlarged. 540 p. 8 vo. il. 1903. \$6.00

CONTENTS: Beet sugar. A criticism of the arguments of present day beet sugar promoters. Valuation and purchase of sugar beets. Preliminary treatment. Diffusion, Carbonation and filtration. Concentration of beet juice to syrup by multiple effect evaporation vessels. Boiling beet syrup to strike point in vertical and horizontal vacuum pans; Centrifuging of beet sugar. Extraction of all available sugar from beet-sugar molasses; Cane sugar. The sugar cane and its cultivation; Sugar cane diffusion, Sugar refining; The chemistry of sugars—Analysis of commercial sugars and of merchandise, etc., containing sugars.

**McKAIL, DAVID.** Public Health Chemistry and Bacteriology. 417 p. 8 vo. 1912. \$2.50

**McKEE, RALPH H.** Shale Oil. American Chemical Society Monograph. About 275 p. Ready about February 1, 1922.

**MACKENZIE, JOHN E.** The Sugars and Their Simple Derivatives. 242 p. 8 vo. il. 1914. \$3.50

The appeal of this book is to those interested in chemistry, medicine, brewing and distillation, sugar manufacture, etc., and much attention has been given to the subjects of metabolism, fermentation, and the manufacture of sugars. It has been prepared to serve as a supplement to works on physiological chemistry and to technological works on brewing, distilling, sugar manufacture and sugar analysis.

CONTENTS: Introduction. Sucrose, Maltose, Lactose, Glucose, Glucosamine. Configuration. Disaccharides and tetroses. Pentoses. Methylpentoses, Aldohexoses, Tetrahexoses, Disaccharides, Triaccharides, Tetrasaccharides, Glucosides, Fermentation, Metabolism Index.

**MACLAREN, J. M.** Gold. Its geological occurrence and geographical distribution. 687 p. 8 vo. 1908. \$10.00

**MACLEAN, HUGH.** Lecithin and Allied Substances, The Lipins. 213 p. 8 vo. 1918. \$2.75

CONTENTS: Introduction and nomenclature; The chemistry of the phosphatides; The occurrence, methods of extraction, isolation and purification of the phosphatides; The cerebroside; Protagon; Allied lipins; Plant lipins; The function of lipins.

**McLEOD, ALEXANDER.** Practical Instructions in the Search for and Determination of the Useful Minerals, including the rare ores. For the prospector, miner, and as a ready reference for everybody interested in the mineral industry. Second edition, greatly enlarged. 281 p. 16 mo. 1917. \$2.50

**MACLEOD, W. A., and WALKER, CHARLES.** Metallurgical Analysis and Assaying. 318 p. 8 vo. il. 1903. \$4.50

**McMILLAN, WALTER G.** A Treatise on Electro-Metallurgy. Revised by W. R. Cooper, M.A. Third edition, revised and enlarged. 425 p. 8 vo. il. 1910. \$4.35

Embracing the application of electrolysis to the plating, depositing, smelting, and refining of various metals, and to the reproduction of printing surfaces and art-work.

**McPHERSON, WILLIAM, and HENDERSON, WILLIAM EDWARDS.** Course in General Chemistry. Second edition. 735 p. il. 8 vo. 1921. \$3.00

CONTENTS: Matter and energy; Oxygen; Hydrogen; Properties of gases; Water, Hydrogen peroxide; The states of matter; The laws of chemical combination, The atomic theory; Equations and calculations; Valence; Carbon; Carbon dioxide; Nitrogen and the rare elements; Helium; Neon; Argon; Krypton; Xenon; The atmosphere, Solutions; Chlorine; Hydrochloric acid; Acids; Salts; Sodium, Sodium hydroxide; Bases; Ionization; Some applications of the theory of ionization; Compounds of nitrogen; Equilibrium; Sulphur; Selenium; Tellurium; Hydrogen; The periodic law; The structure of atoms; The chlorine family; The oxygen compounds of the halogens; Some compounds of carbon; Molecular weights; The hydrocarbons; Coal tar compounds; Flames, Fuel gases, Explosions; Thermochemistry; Carbohydrates; Alcohols, Organic acids and their derivatives; The phosphorus family; The silicon family and boron; Colloids; Metals; The alkali metals; The alkaline earth metals; The magnesium family; The aluminum group; The silicate industries; The iron family; Copper; Mercury; Silver; Tin and lead; Manganese and chromium; The vanadium and molybdenum families; Radioactivity; Gold and the platinum family; Index; Appendix.

**MADDOX, H. A.** Paper: Its History, Sources and Manufacture. (Pitman's Common Commodities and Industries.) 159 p. 12 mo. il. 1919. \$1.00

CONTENTS: History of paper manufacturing; The evolution of paper making; Cellulose and its compounds; The characteristics of fibers; Treatment of materials; Rags, Esparto straw; Manufacture of wood pulp; Soda recovery, Treatment in the beater, Beaters and reamers; Loading, sizing, coloring; The paper-making machine, Hand-made paper, The various finishes imparted to paper; Coated paper; Testing.

**MAHIN, E. G.** Quantitative Analysis. By Edward G. Mahin, Ph.D., Professor of Analytical Chemistry, Purdue University. 510 p. 8 vo. il. 1914. \$4.00

A textbook and teaching manual that is sufficiently full in its details to be of use to the analyst in practice. It is broader in scope and fuller in treatment than the usual laboratory textbook.

MAIN DIVISIONS: Part I—General principles, Part II—Gravimetric analysis, Experimental gravimetric analysis; Electro-analysis Part III—Volumetric analysis; Color changes of indicators; Standardization, Experimental volumetric analysis; Analysis of industrial products and raw materials.

**MAKOWER, W., and GEIGER, H. G.** Practical Measurements in Radio-Activity. By W. Makower, D.Sc., Lecturer and Demonstrator in Physics; and H. G. Geiger, Ph.D., Lecturer in Physics, University of Manchester. 161 p. 8 vo. il. 1912. \$2.20

**MANLOVE, G. H., and VICKERS, G.** Scrap Metals; study of iron and steel old material, its preparation and markets, by G. H. Manlove; The Old Metals by G. Vickers. 278 p. 12 mo. 1918. \$2.00

**MANLY, HAROLD PHILLIPS.** Oxy-acetylene Welding and Cutting, Electric Forge and Thermit Welding; together with related methods and materials used in metal working, and the oxygen process for the removal of carbon. 215 p. 16 mo. il. 1916. \$1.50

A practical handbook fairly well illustrated. Twenty-two pages are devoted to descriptions of metals and alloys, with brief references to annealing, hardening, tempering, and case hardening of steel. Over one hundred pages have to do with oxy-acetylene welding and the production and handling of the gases. Chapter six concerns the several methods of electric welding, and chapter seven tells about hand forging and welding. Chapter eight discusses soldering, brazing, and thermit welding, while chapter nine touches briefly on the oxygen process for the removal of carbon from gas-engine cylinders.

**MARKS, LIONEL S.** Mechanical Engineers' Handbook; based on the Hütte and prepared by a staff of specialists. 1836 p. 12 mo. il. 1916. \$7.00

Comprises closely packed and conveniently arranged information by well known writers, each an expert in his field. Similar in character to the German Hütte, which it follows in the more theoretical sections, although changes have been made to meet American conditions. Those portions dealing with engineering practice are stated to be entirely new. Electrical and civil engineering are included to some extent and there are special sections devoted to aeronautics, automobiles, building construction, heating and ventilation, illumination, refrigeration, and railway engineering. Well provided with illustrations and bibliographical references. A mine of information for the engineer or the technical librarian.

**MARSHALL, ALBERT E.** The Fertilizer Industry. To be published by The Chemical Catalog Co., Inc. Ready about October 1, 1922.

**MARSHALL, ARTHUR.** Explosives. Second edition, revised and enlarged. 2 vols. 8 vo. il. 1917. \$16.00

**MARSON, PERCIVAL.** Glass and Glass-making. (Pitman's Common Commodities and Industries.) 127 p. 12 mo. il. 1919. \$1.00

CONTENTS: History; The chemistry of glass-making and the materials used; The chemical and physical properties of glass; The composition of the different kinds of glass; Colored glass and artificial gems; Decolorizers; The refractory materials used; Glass-house furnaces; Glass-melting pots and their manufacture; Lehrs and annealing; The manipulation of glass-makers' tools and machines; Crown, sheet and plate glass; Tube, cane and chemical glassware; Optical glassware; English and foreign methods of glass manufacturing compared.



**MARTIN, F. W.** *A Laboratory Guide to Qualitative Analysis with the Blow-pipe.* 47 p. 8 vo. \$0.60  
Presents tables for the determination of the various elements by the blow-pipe.

**MARTIN, GEOFFREY.** *Industrial and Manufacturing Chemistry.* 3 vols. 8 vo. 1920.  
Organic. One vol. 744 p. il. \$12.00  
Inorganic. Two vols. Vol. 1, 496 p. Vol. 2, 483 p. Each, \$12.00  
The Soil. Three vols. \$36.00

**MARTIN, GEOFFREY.** *Modern Chemistry and Its Wonders.* A popular account of some of the more remarkable recent advances in chemical science. 267 p. 12 mo. il. 1915. \$3.00  
CONTENTS: The wonderland of modern chemistry. The romance of some simple nitrogen compounds. The romance of explosives. Radium and the new chemistry. The mystery of the periodic law. The radio elements and the periodic law. Modern alchemy. Applications of electricity to chemistry. The romance of hydrocarbons. The romance of sugar. The romance of alcohol. The romance of common salt. Metallic freestones. Artificial precious stones. The really wonderful achievements of modern scientific chemistry are popularly explained in this work.

**MARTIN, GEOFFREY.** *Triumphs and Wonders of Modern Chemistry.* A popular treatise on modern chemistry and its marvels, written in non-technical language for general readers and students. 378 p. 8 vo. il. 1912. \$3.00  
CONTENTS: The mystery of matter. The underworld of atoms. Distribution and evolution of the elements. The wonders of chemical change. Water. The element hydrogen. The air. Oxygen, the life supporting element. The element nitrogen. The element carbon. Carbon dioxide. Silicon and its compounds. Sulphur and its compounds. The phosphorous group of elements. Fire, flame and spectral analysis.

**MARTIN, GEOFFREY, and Others.** *Industrial Gases;* including the liquefaction of gases and the manufacture of hydrogen, oxygen, nitrogen, carbon dioxide, sulphur dioxide, ammonia, producer gas, illuminating gas, acetylene, ozone, etc. 150 p. 8 vo. il. 1916. \$4.00

Large industries based upon new developments in the technology of gases—surprisingly large to the layman to whom these developments are new—have come into being during the past few years. Gaseous nitrogen has created the industry of cyanamide, so widely used as a fertilizer and as the basis of many other nitrogen compounds. Hydrogen has acquired importance in the hardening of fats and in aeronautics. The manufacture of synthetic ammonia from the atmosphere is commercially successful, and although the secrets of actual methods are carefully guarded, there is described in this book whatever has been made public.

This work, the seventh of an important series on chemical technology, gives in concise form and from many scattered sources the present state of the art of each of the subjects cited in the subtitle. It is clearly illustrated and the reference list on patent literature is stated to be as complete as possible.

**MARTIN, GEOFFREY, SMITH, STANLEY, and MILSON, F.** *The Salt and Alkali Industry;* including potassium salts and the Stassfurt industry. 112 p. 8 vo. il. 1916. \$3.00

CONTENTS: The salt industry; The manufacture of hydrochloric acid; The manufacture of sodium sulphate (saltcake); General survey of the sodium carbonate industry. The manufacture of the sodium carbonate and caustic soda by the Leblanc process. Manufacture of sodium carbonate by the ammonia soda process. The Stassfurt industry; Potassium salts.

**MARTIN, GEOFFREY; and FOUCAR, J. L.** *Sulphuric Acid and Sulphur Products.* 80 p. 4 to. 1916. \$4.00

**MARTINEAU, GEORGE.** *Sugar, Cane and Beet.* (Pittman's Common Commodities and Industries) 161 p. il. 12 mo. 1919. \$1.00

CONTENTS: A retrospect, Cane and beet, Cane juice, Beet juice, Clarification, Crystallization, Sugar refining, The cane industry, The beet industry; Competition; Diplomacy, The sugar market.

**MASON, W. P.** *Examination of Water.* (Chemical and Bacteriological.) By William P. Mason, Professor of Chemistry, Rensselaer Polytechnic Institute. Fifth edition, revised. 186 p. 12 mo. il. 1917. \$1.50

Gives suggestions for the determination of mineral matters in water, and presents such material on the bacteriological examination as has been demonstrated to be of real service to the water examiner.

**MATHESON, EWING.** *Depreciation of Factories, Mines and Industrial Undertakings.* 230 p. 12 mo. 1914. \$3.50

**MATHEWS, ALBERT P.** *Physiological Chemistry.* A textbook and manual for students. Second revised edition. 1,055 p. 8 vo. il. 1916. \$4.50

**MATTHEWS, ERNEST R.** *Refuse Disposal.* A practical manual for municipal engineers, members of local authorities, etc. 160 p. 12 mo. il. 1915. \$2.00

CONTENTS: Collection of home refuse. Unsanitary methods of disposal. Conversion into manure. Destruction by burning. Types of destructors. The Meldrum destructor. The Heenan destructor. Other types of destructors. The Dawson Mansfield destructor. Installation of villages, hospitals, etc. Use for the clinker. Chimney construction. Steel plate chimney construction. Principles of vacuum cleaning. Index.

**MATTHEWS, F. E.** *Elementary Mechanical Refrigeration.* By F. E. Matthews, B.S., M.E., E.E. 172 p. 8 vo. il. 1912. \$2.50

A straightforward treatise on the elements and principles of mechanical refrigeration for the man who is not a specialist, but needs concise working data. It is designed for the engineer, draftsman and layman who wants to understand the principles and their application.

CONTENTS: Part I.—I.—Cold and its production. II.—The development of mechanical refrigeration. III.—Commercial systems of refrigeration. IV.—Compression systems. V.—Simple comparisons.

VI.—Ice-making systems. VII.—The installation and operation of refrigerating systems. VIII.—Working pressures. IX.—Cleaning the system. X.—Capacity of refrigerating machines. XI.—Cold storage duty.

**MATTHEWS, J. MERRITT.** *Bleaching Technology.* About 650 p. 8 vo. Nearly 300 il. 1921. \$8.00

CONTENTS: Introduction. The wool fiber and its impurities; The scouring of wool; Machinery for wool scouring. Ry products in wool scouring. The bleaching of wool; The boiling-off of silk. The bleaching of silk. Boiling-out of cotton. Bleaching of cotton. Bleaching of cotton cloth. Bleaching of linen. Bleaching of other vegetable fibers and materials. Stripping of dyed colors. Testing of materials used in bleaching. Materials used in bleaching.

**MATTHEWS, J. MERRITT.** *The Textile Fibers.* Their physical, microscopical and chemical properties. By J. Merritt Matthews, Ph.D. Third edition, rewritten. 630 p. 8 vo. il. 1913. \$5.00

A systematic presentation of all the facts concerning textile fibers. CONTENTS: Classification. Wool and hair fibers. Shoddy and wool substitutes. Minor hair fibers. Origin and cultivation of the physical and chemical properties of silk. Vegetable fibers. Cotton. Chemical properties of cotton. Mercerized cotton. Minor seed hairs. Artificial silks. Linen. Jute. Ramie. Hemp. Minor vegetable fibers. Analysis of the textile fibers. Textile fabrics and yarns.

**MATTHEWS, J. MERRITT.** *The Application of Dyestuffs.* 768 p. 8 vo. 103 il. 1920. \$10.00

CONTENTS: Introduction. Chemical Study of the Fibers; Scouring the Textile Fibers, Bleaching of Wool and Silk, Bleaching of Cotton; Classification of Dyes, Application of Acid Dyes to Wool, Application of Acid Dyes to Silk, Cotton, etc.; Representative Acid Dyes; Stripping of Colors, Testing Fastness of Dyes, Application of Basic Dyes, Basic Dyes on Cotton, Principal Basic Dyes, Application of Substantive Dyes to Cotton, Substantive Dyes on Wool and Silk; Developed Dyes on Cotton and Silk; Application of Mordant Dyes, Sulphur Dyes, The Vat Dyes, Aniline Black, Use of Logwood in Dyeing, The Minor Natural Dyes, The Mineral Dyestuffs, Dyeing of Fabrics Containing Mixed Fibers, Application of Dyes to Minor Vegetable Fibers, Linen, Ramie, Hemp, Jute, and Artificial Silk, Theory of Dyeing; Testing the Fastness of Colors, Application of Dyes to Various Materials, Application of Dyestuffs in the Preparation of Lakes, Inks, etc.; Testing of Dyestuffs, Miscellaneous Tests in Dyeing, Chemical Reactions of Dyestuffs; Analysis of Textile Fabrics, Useful Data for Dyers and Textile Chemists.

**MAUIER, AUSTIN R., and BROMLEY, C. H.** *Fuel Economy in Boiler Rooms;* a development of "Fuel economy and CO<sub>2</sub> records" published in "Power." 308 p. 8 vo. il. 1918. \$3.00

**MAXTED, CHESTER C.** *Catalytic Hydrogenation and Reduction.* 140 p. 12 mo. 1919. \$1.25

**MAXWELL, FRANCIS.** *Sulphitation in White Sugar Manufacture.* 84 p. 8 vo. 1916. \$4.00

CONTENTS: Sulphur and its compounds in the manufacture of sugar; Sulphate, Sulphurous acid, Generating plants and sulphitation vessels; Control of the sulphurous acid gas generating station; Analysis of gas; Action of acid on juices; Principles of the application of sulphitation to juice; Sulphitation of syrup and molasses, sulphitation process, Processes adopted, Summary.

**MAXWELL, J. C.** *Matter and Motion.* Reprinted with Notes and Appendices by Sir Joseph Larmor. 178 p. il. 12 mo. 1920. \$2.00

CONTENTS: Introduction, On motion, On force, On the properties of the center of mass of a material system, On work and energy, Recapitulation, The pendulum and gravity, Universal gravitation; On the equations of motion of a connected system, Appendix, The Relativity of the forces of nature, The principle of least action.

**MAY, P.** *The Chemistry of Synthetic Drugs.* By Percy May, D.Sc. 250 p. 8 vo. 1918. \$4.25

New drugs are constantly appearing on the market, and though well known and widely used, their chemical nature is often unknown even to chemists possessing a good knowledge of general organic chemistry. The present volume is intended to supply this information, including the guiding principles which are used in the production of these drugs.

**MEAD, DANIEL WEBSTER.** *Water Power Engineering.* The theory, investigation and development of water powers. Second edition. 843 p. 8 vo. il. 1915. \$6.00

A complete revision. Author is professor of hydraulic engineering in the University of Wisconsin. Has supplementary chapters on well known plants, costs, financial and commercial considerations, operation and maintenance, with tables covering tests on standard turbines.

**MEADE, ALWYNE.** *Modern Gasworks Practice.* 529 p. 4 to. il. 1916. \$8.50

Considers chiefly the British practice of planning and laying out of construction works and equipment, including the use of electricity and the mechanical handling of material. There are also chapters on gas coal and its carbonization, the condensation of gas, exhausting machinery, gas purification, the recovery of cyanogen, and the manufacture and use of water gas.

**MEADE, R. K.** *Portland Cement.* Its composition, raw materials, manufacture, testing and analysis. By Richard K. Meade. 512 p. 8 vo. il. 1911. \$5.00

CONTENTS: Introduction. Chapter I.—Relation between mortar materials and history of the development of the American Portland cement industry. Chapter II.—The nature and composition of Portland cement. *Manufacture.* Chapter III.—Raw materials. Chapter IV.—Proportioning the raw materials. Chapter V.—Quarrying, excavating, drying and mixing the raw materials. Chapter VI.—Grinding the raw materials and grinding machinery. Chapter VII.—Burn ing—kilns and process. Chapter VIII.—Burning (continued)—fuel and preparation of the same. Chapter IX.—Cooling and grinding the clinker, storing and packing the cement, etc. *Analytical methods.* Chapter X.—The analysis of cement. Chapter XI.—The analysis of cement mixtures. Chapter XII.—Analysis of the raw materials. *Physical testing.* Chapter XIII.—The inspection of cement. Chapter XIV.—

**Specific gravity.** Chapter XV.—**Fineness.** Chapter XVI.—**Time of setting.** Chapter XVII.—**Tensile strength.** Chapter XVIII.—**Soundness.** Chapter XIX.—**The detection of adulteration in Portland cement.** Chapter XX.—**The investigation of materials for the manufacturing of Portland cement.** Appendix—tables.

**MEADE, RICHARD K.** *The Chemist's Pocket Manual.* Third edition. A practical handbook containing tables, formulas, calculations, information, physical and analytical methods for the use of chemists, chemical engineers, assayers, metallurgists, manufacturers and students. By Richard K. Meade, M.S. 530 p. 16 mo. 1918. \$4.00

**MEDICUS, LUDWIG.** *A Brief Introduction to Qualitative Analysis.* Eighth edition. Translated by John Marshall. 215 p. 8 vo. il. 1913. \$2.25

**CONTENTS:** Introduction. Properties of the bases. Properties of the acids. Preliminary examination. Solution and fusion. Detection of the bases in the wet way. Examination of acids. Appendix. Behavior of the compounds of the rare elements. Examples for practice in testing for the rare elements. Index.

**MEES, C. E. KENNETH.** *Organization of Industrial Scientific Research.* 175 p. 8 vo. 1920. \$2.00

**CONTENTS:** I. Introduction. II. Types of Research Laboratories. III. Cooperative Laboratories. IV. The Position of the Research Laboratory in an Industrial Organization. V. The Internal Organization of Industrial Research Laboratories. VI. The Staff of a Research Laboratory. VII. The Building and Equipment of the Laboratory. VIII. The Direction of the Work. IX. The Design of a Research Laboratory for a Specific Industry.

**MEGRAW, H. A.** *Details of Cyanide Practice.* 215 p. 8 vo. 1914. \$2.00

**CONTENTS:** Preface. I.—The cobalt district, Ontario. II and III.—The Nipissing high grade mill. Cobalt. IV.—The Hollinger mill, Porcupine, Ontario. V.—The Dome mill, South Porcupine, Ontario. VI.—Practice in the Black Hills, South Dakota. VII.—The Liberty Bell mill, Telluride, Colorado. VIII.—Practice at Cripple Creek, Colorado. IX.—Continuous decantation of slime. X, XI and XII.—Practice at Tonopah. XIII.—The Nevada Hills mill at Fairview. XIV.—Practice at the Nevada Wonder Mill. XV.—Methods at Republic. XVI.—The mills of Grass Valley, California. XVII.—The Black Oak plant, California. XVIII.—The Gold Road Mill, Arizona. XIX.—Two Arizona mills. Index.

**MEGRAW, H. A.** *The Flotation Process.* Second edition, revised and enlarged. 359 p. 8 vo. il. 1918. \$4.00

**CHAPTER HEADINGS:** I.—Concentration by flotation. II.—The patent record of flotation. III.—The theory of flotation. IV.—Oils and their uses. V.—Flotation processes and apparatus. VI.—Testing ores for flotation. VII.—Testing at the Anaconda mill. VIII.—The applications of flotation. IX.—Examples of flotation practice. X.—Flotation operating plants. XI.—Flotation concentration at Anaconda. XII.—Flotation in practice. XIII.—The practice of flotation. XIV.—The place of flotation in metallurgy.

**MEGSON, J. E., and JONES, H. S.** *The Diesel Engine in Practice,* by J. E. Megson and H. S. Jones. 136 p. 16 mo. il. 1916. \$2.00

Based, it is stated, upon many years of practical experience, this pocket sized manual is dedicated to the purchaser and his engineer. Sketches briefly the history of the engine and its mode of working. There are chapters on fuel, the effect of altitude, operation and care, life and reliability, description of modern engines (chiefly American), economics, and the application to marine purposes.

**MELDOLA, R.** *The Chemical Synthesis of Vital Products and the Interrelation between Organic Compounds.* By Raphael Meldola, F.R.S., Professor of Chemistry, City and Guilds of London Technical College. Vol. I, 355 p. 8 vo. 1904. \$6.75

**MELLOR, J. W.** *Clay and Pottery Industries.* Being volume I of the collected papers from the County Pottery Laboratory, Staffordshire. 411 p. 8 vo. il. 1914. \$6.00

No industry calls so obviously for the application of science as the manufacture of pottery. Within this volume are papers describing the results of important investigations in every field of the industry as they were carried out at the Staffordshire Pottery School in a thriving pottery district in England.

**MELLOR, J. W.** *Higher Mathematics for Students of Chemistry and Physics.* By J. W. Mellor, D.Sc. Fourth edition, enlarged. 662 p. 8 vo. il. 1913. \$7.00

Professor Mellor in the present volume attempts to show the relations which the pure abstractions of calculus, differential equations, etc., bear to the problems of the sciences. He discusses each of these branches of mathematics, presupposing a previous knowledge of algebra and trigonometry, and brings out their inner meaning by constant reference to analogous operations in the physical sciences.

**MELLOR, J. W.** *Introduction to Modern Inorganic Chemistry.* By J. W. Mellor, D.Sc. New edition 700 p. 8 vo. 1914. \$2.75

An abridgment of the author's "Modern Inorganic Chemistry" (see below) in a simpler dress, which has been adapted to suit beginners' classes in chemistry. It retains all the admirable features of the larger book.

**MELLOR, J. W.** *Modern Inorganic Chemistry.* By J. W. Mellor. New edition. 928 p. 8 vo. il. 1912. \$4.00

This book is written from the modern standpoint, and the more recently established principles of physical chemistry have been woven with the facts generally taught in college courses. The historical method has been followed wherever possible and the whole subject developed in its most logical teaching order.

**MELLOR, J. W.** *A Treatise on Quantitative Inorganic Analysis.* With special reference to the analysis of clays, silicates, and related minerals. 788 p. 8 vo. il. 1913. \$9.00  
Vol. I of a Treatise on the Ceramic Industries.

**CONTENTS:** Part I.—General—Introduction. Weights and measures. Volumetric analysis. Colorimetry and turbidity. Filtration and washing. Heating and drying. Polymerization and grinding. Sampling. The reagents. Part II.—Typical silicate analyses. Clays.—The determination of volatile matters. Opening up silicates. The determination of silica. The ammonia precipitate. The determination of iron. The determination of titanium. The determination of calcium and magnesium. The determination of alkalis. Abbreviated analyses and analytical errors. Electro-analysis. Part III.—Analysis of glasses, glazes, colours and complex silicates. The analysis of glass, glazes, enamels, and colours. The determination of arsenic. The determination of antimony. The determination of tin. The determination of lead. The determination of bismuth and mercury. The determination of copper and cadmium. The determination of zinc. The determination of manganese. The determination of cobalt and nickel. Part IV.—Special methods. Bases.—The determination of molybdenum, tungsten, columbium, and tantalum. The determination of gold and selenium. The determination of aluminium and beryllium. Special methods for iron compounds. The determination of chromium, vanadium, and uranium. The determination of zirconium, thorium, and the rare earths. Special methods for the determination of barium, strontium, calcium, and magnesium. Special methods for the determination of alkalis and their salts. Part V.—Special methods—acids and non-metals.—The determination of carbon, free and combined. The determination of water. The determination of boron oxide. The determination of phosphorus. The determination of sulphur. The determination of the halogens. The rational analysis of clays. Appendix. Tables. The library. Index of names. Index of subjects.

**MENDELEEFF, D.** *The Principles of Chemistry.* By D. Mendeleeff. Translated from the seventh Russian edition by George Kamensky, A.R.S.M., of St Petersburg, and edited by Thomas H. Pope, B.Sc., F.I.C. Third English edition. 2 vols. 8 vo. 1905. Vol. I, 662 p.; Vol. II, 559 p. Per set \$10.50

The third edition of this standard work contains not only numerous additions to fact such as the liquefaction of gases, the rare atmospheric elements, the subject of radioactivity, etc., but as well complete revisions of the theoretical portion. The work is specially intended to give an insight into the unchangeable substratum underlying the varying forms of matter.

**MERRILL, G. P.** *The Non-Metallic Minerals.* By George P. Merrill. Second edition, revised. 432 p. 8 vo. 1910. \$5.00

Collects notes relating to minor minerals and non-metallic compounds of a mineral nature. Includes cements, coals, phosphates, etc. **CONTENTS:** The elements. Sulphides and arsenides. Halides. Oxides. Carbonate. Silicates. Nitrates, tantalates, and tungstates. Phosphates and vanadates. Nitrate. Borates. Uranates. Sulphates. Hydrocarbon compounds. Miscellaneous.

**MERRIMAN, M.** *American Civil Engineers' Handbook.* By Mansfield Merriman, Editor-in-Chief, and fifteen associate editors. Fourth edition, enlarged. 1955 p. 16 mo. il. 1920. Flexible binding. \$7.00

A book prepared upon practical principles selecting those topics to which civil engineers most frequently desire to refer, condensing the matter so that the greatest amount may be put in the assigned space, and at the same time, be clearly presented.

**MIERZINSKI, S.** *The Waterproofing of Fabrics.* Translated from the German by Arthur Morris and Herbert Robson. Third edition, revised and enlarged. 140 p. 12 mo. 1920. \$2.50

**CONTENTS:** Definition; Preliminary treatment of the fabric; Waterproofing with a tate of alumina; Impregnation of the fabric; Drying; Waterproofing with paraffin wax, ammonium cuprate and insoluble soaps of metallic oxides; Dyeing waterproof fabrics; Waterproofing with gelatine, tannin, caseinate of lime and other bodies; Manufacture of tarpaulin; British waterproofing patents.

**MILLAR, A.** *Wheat; from the grower to the consumer.* 140 p. 12 mo. 1916. \$1.00

**MILLARD, E. B.** *Physical Chemistry for Colleges.* By E. B. Millard, Assistant Professor of Physical Chemistry, Massachusetts Institute of Technology. 416 p. 8 vo. 1910. \$3.50

A textbook on the more important aspects of physical chemistry, together with accurate modern data which illustrate the applicability of its laws to the phenomena observed in the laboratory.

**CONTENTS:** I. Determination of atomic weights. II. Laws of gases. III. Liquid substances. IV. Solids. V. Solutions—Ideal solutions. VI. Ionized solutions. Electrical conductivity. VII. Thermochemistry. VIII. Homogeneous chemical equilibrium. IX. Heterogeneous chemical equilibrium. X. Velocity of chemical reactions. XI. Physical properties and chemical structure. XII. The periodic law. XIII. Radiochemistry and radioactivity. XIV. Atomic structure. XV. Surface chemistry and colloids. XVI. Electrochemistry; electromotive force.

**MILLIKAN, ROBERT ANDREWS.** *The Electron; its isolation and measurement and the determination of some of its properties.* 268 p. 8 vo. il. 1917. \$1.75

"The purpose of this volume is to present the evidence for the atomic structure of electricity, to describe some of the most significant properties of the elementary electrical unit, the electron, and to discuss the bearing of these properties upon the two most important problems of modern physics: the structure of the atom and the nature of electromagnetic radiation." Since the book is intended for the general reader as well as for the physicist all mathematical tables have been placed in appendices.

**MINERAL INDUSTRY, The.** Vol. XXVIII. 1919. Edited by G. A. Roush, Assistant Professor of Metallurgy, Lehigh University. 1000 p. 8 vo. il. 1920. \$10.00

The latest technology in all fields and the statistics of production of all commercially important minerals made available many months ahead of other sources. It is the indispensable tool of every metallurgist, mining engineer and chemist. It is an exhaustive review, not only of a statistical but a general nature. Every article is the work of a specialist. Every commercially valuable metal from aluminum to zinc is covered in alphabetical order fully and authoritatively.

**MITCHELL, C. A.** *Edible Oils and Fats.* 156 p. 8 vo. il. 1918. \$2.50

**CONTENTS:** The nature, composition and properties of fats. Constituents of oils and fats. Extraction and purification. Methods of examination. Characteristics of individual oils and fats. Butter and butter fat. Hardened or hydrogenated oils. Manufacture of margarine. Bibliography. Indexes.

**MITCHELL, CHARLES AINSWORTH.** *Flesh Foods. A practical handbook for medical men, analysts, inspectors, and others.* 336 p. 12 mo. il. 1900. \$3.50

**CONTENTS:** Structure and chemical composition of muscular fiber. Structure and composition of connective tissue and blood. The flesh of different animals. The examination of flesh. Methods of examining animal fat. The preservation of flesh and the composition and examination of preserved flesh products. The composition and analysis of sausage. The products of flesh. Meat extracts and flesh peptones. The cooking of flesh. Poisonous flesh. The animal parasites of flesh. The bacteriological examination of flesh. The extraction and separation of ptomaines. Index.

**MITCHELL, C. AINSWORTH.** *Oils: Animal, Vegetable, Essential, and Mineral.* (Pitman's Common Commodities and Industries.) 138 p. il. 12 mo. 1920. \$1.00

**CONTENTS:** Part I. Fixed oils, fats, waxes, vegetable oils, non drying oils, Semi-drying oils, Drying oils, Vegetable oils, Solid fats, Butter, Animal oils, Fish oils, Marine animal oils, Waxes. Part II. Essential oils. Volatile oils used in perfumery. Volatile oils used as flavoring agents. Volatile oils used as solvents. Part III. Mineral oils. Appendix—The trade in oil.

**MITCHELL, C. AINSWORTH.** *Vinegar: Its Manufacture and Examination.* 201 p. 8 vo. il. 1916. \$3.50

Deals with English practice and endeavors to make clear the scientific principles underlying each stage of the manufacture, and to indicate the lines upon which the development of the industry is possible. Chapter I tells in an interesting way about the history of the art.

**CONTENTS:** Historical introduction. Theories of acetic fermentation. The acetic bacteria. Chemical reactions in acetic fermentation. Preparation of the gyle. Acetification of the gyle. Treatment of the crude vinegar. Method of examination. Characteristics of different vinegars. Appendix I—Import duties on vinegar and acetic acid. Appendix II—French duties on vinegar. Index.

**MITCHELL, CHARLES AINSWORTH, and HEPWORTH, T. C.** *Inks; their composition and manufacture, including methods of examination and a full list of English patents.* Second edition, revised. 266 p. 12 mo. il. 1916. \$3.00

**CONTENTS:** Historical introduction. Section I—Writing inks. Carbon and carbonaceous inks. Tannin materials for inks. Nature of inks. Manufacture of iron gall inks. Logwood, vanadium, and aniline black inks. Coloured writing inks. Examination of writing inks. Section II—Printing inks. Early methods of manufacture. Manufacture of varnish. Preparation and incorporation of the pigment. Coloured printing inks. Section III—Inks for miscellaneous purposes. Copying inks. Marking inks. Safety inks and papers. Sympathetic inks. Inks for special purposes. List of English patents. Index.

**MITCHELL, C. A., and PRIDEAUX, R. M.** *Fibers Used in Textile and Allied Industries.* 208 p. 8 vo. il. 1910. \$3.50

**CONTENTS:** Introduction. Wool. Vicuna. Camel hair. Alpaca. Llama hair. Mohair. Cashmere. Goats' hair. Cow hair. Horse hair. Deer hair. Reindeer hair. Rabbits' hair. Cats' hair. Dogs' hair. Kangaroo's hair. Human hair. Silk. Cotton. Mercerized cotton. Artificial silks. Linnen. Flax wax. Ramie. Jute. Hemp. Sisal hemp. Pita fiber. Manila hemp. Musa paradisiaca fiber. Banana fiber. Andosoma fiber. Sausseira fiber. Sunn hemp. Gambo hemp. New Zealand flax. Mauritius hemp. Yecum fiber. Pineapple fiber. Brush fibers. Vegetable down and upholstery fibers.

**MITCHELL, CHARLES A.** *Mineral and Aerated Waters.* 227 p. 8 vo. 1913. \$3.00

**CONTENTS:** Origin and Properties of Natural Mineral Waters. Gases in Natural Waters. Hot Wells. The Zim-Zem Well at Mecca. Spas and Their Springs. Natural Mineral Table Waters. Thermal Springs and Radio-Activity. Temperatures. Helium and Niton in Mineral Waters. Measurement of Radio-Activity. Artificial Radio-Active Mineral Waters. Carbon Dioxide, Its Preparation. Properties and Uses in the Mineral Water Factory. Aerated Mineral Waters. Early Forms of Carbonating Waters. The Machinery of To Day. Arrangement of a Soda Water Factory. Bottles and Bottling Machinery. Making of Ginger Beer. Examination of Mineral Waters. Bibliography.

An outline of the early methods of making artificial mineral waters leading up to a description of the apparatus of the modern carbonating plant. Gives much information concerning many of the European Spas and their springs, together with analyses of their waters.

**MOELLER-KRAUSE, W.** *Practical Handbook for Beet-Sugar Chemists.* By Werner Moeller-Krause, Sugar Chemist. 132 p. 8 vo. il. 1914. \$1.50

**CONTENTS:** Chapter I.—Sugars. Chapter II.—The polariscopes. Chapter III.—Short outline of the manufacture of sugar and of the methods to dehydrate molasses. Chapter IV.—The analysis of sugar beets. Chapter V.—The analysis of beet and thin juices. Chapter VI.—The analysis of molasses, molasses, thick juices and sirups. Chapter VII.—The analysis of sugars. Chapter VIII.—The analysis of pulp, waste water, limecakes and condensed water. Chapter IX.—The analysis of saccharates. Chapter X.—Miscellaneous notes. Chapter XI.—The analysis of water. Chapter XII.—The analysis of limestone. Chapter XIII.—The analysis of limekiln and chimney gases. Chapter XIV.—The analysis of coal and coke. Chapter XV.—The preparation of solutions, standard acids, etc. Chapter XVI.—Tables.

**MOISSAN, H.** *The Electric Furnace.* By Henri Moissan. Authorized translation by Victor Lenher, Ph. D., University of Wisconsin. 305 p. 8 vo. il. 1904. \$3.50

**CONTENTS:** I.—Description of the different models of electric furnaces. II.—Various modifications of carbon. III.—Preparation of some simple substances in the electric furnace. IV.—Carbides, silicides, borides, phosphides, arsenides, and sulphides.

**MOLDENKE, RICHARD.** *Principles of Iron Founding.* 517 p. 8 vo. 1917. \$5.00

Authoritative treatise by an eminent iron metallurgist on the underlying principles of the art of iron founding. Does not enter into details of general foundry practice, which are to be taken up in a companion volume to be published later. The present volume contains chapters on the outlines of iron metallurgy, and iron-making processes, properties of cast iron, classification of castings, foundry raw materials, technology of combustion, melting processes, mixture-making, testing cast iron, etc. Glossary of terms pp. 459-463.

**MOLESWORTH, G. L.** *Metric Tables.* 104 p. 32 mo. 1917. \$1.00

**MOLINARI, E.** *General and Industrial Inorganic Chemistry.* By Ettore Molinari, Professor of Industrial Chemistry to the Society for the Encouragement of Arts and Manufactures and of Merceology of the Luigi Bocconi Commercial University in Milan. From the fourth Italian edition, carefully revised and brought up to date. 876 p. 8 vo. il. 1920. \$15.00

**MOOR, CRESACRE GEORGE, and PARTRIDGE, WILLIAM.** *Aids to the Analysis of Food and Drugs.* Fourth edition. 279 p. 16 mo. 1918. \$1.50

**MOORE, A. S.** *Linen: From the Raw Material to the Finished Product.* (Pitman's Common Commodities and Industries.) 132 p. il. 12 mo. 1918. \$1.00

**CONTENTS:** Linen in history. Foundation of Irish linen trade; The Irish Linen Board. The linen riots. Linen outside Ulster; Old linen markets. English linen trade; Scotch linen trade; Linen bounties. Evils of bounties. Factory system introduced. Royal Flax Society. Irish linen trade as it is. Wages and Employment. What the output means; Destination of linen manufactures. Foreign linen manufactures; The raw material. Flax growing; Flax growing in Russia; Preparing the flax; Process of retting; Process of scouring or cleaning; Imports of flax and tow. The spinning mill. Fluctuations of fortune; Hacking; The Spreader and subber. Measuring the yarn; Linen yarn exports; Weaving, warping and weaving. The Jacquard loom; Hand loom weaving; Bleaching and finishing. Finishing; Printing and dyeing; Varieties of linen. Linen cambrics; Making of Unions. Cotton, a nerve computation; How to distinguish linen. Grading of linen; How to reckon fineness. Some technical names. The testing house; Making up and marketing; Market distribution; Conditions of work; A generous action; Healthful improvements; Technical education; Combination and wages; Workers' trade unions; Masters' associations.

**MOORE, FORRIS JEWETT.** *A History of Chemistry.* 292 p. 12 mo. 1918. \$2.50

**CONTENTS:** I.—Chemistry among the ancients. II.—Chemistry in the middle ages. Alchemy. III. Chemistry in the Renaissance. IV. Boyle and his contemporaries. The Phlogiston theory. V.—The later Phlogistons—The discovery of oxygen. VI. Lavoisier. VII.—The law of definite proportions. VIII. Dalton and the atomic theory. IX.—The early history of galvanic electricity. X. Humphry Davy. XI.—Berzelius the organizer of the science. XII. Dualism in organic chemistry. XIII. The reaction against Berzelius. XIV. Gerhardt and the chemical reformation. Williamson. XV.—The transition from the type theory to the valence theory. XVI. The periodic law. XVII. Bunson, Berthelot and Pasteur. XVIII. Organic chemistry since 1860. XIX. Inorganic chemistry since 1860. XX.—The rise of physical chemistry. XXI. Radioactivity—its influence upon the atomic theory.

**MOORE, F. J.** *Experiments in Organic Chemistry.* 29 p. 8 vo. 1915. \$0.75  
Designed as a Laboratory Manual to accompany "Outlines of Organic Chemistry."

**MOORE, F. J.** *Outlines of Organic Chemistry.* Second edition, rewritten. 125 p. 15 figures. 8 vo. 1914. \$2.50

Covers substances which have a wide technical application, like acetylene or kerosene oil, those which are important factors in vital processes like glycogen or urea, those which are familiar in everyday life, like sugar or starch, and those which throw light on some important theory. Covers alcohols, acids, aldehydes, carbohydrates, amino-acids and proteins, aromatic nitrogen compounds, dyes, etc.

**MOORE, HAROLD.** *Liquid Fuels for Internal Combustion Engines.* A practical treatise for engineers and chemists. 215 p. 8 vo. il. 1918. \$5.00

**CONTENTS:** Petroleum. Shale oil and its products; Coal tars and their products; Lignite tars and their products; Production of the carbonization of wood and peat. Animal and vegetable oils; Methyl and ethyl alcohol; fuels for engines fitted with carbureters; fuels for engines fitted with vaporizers. Fuel oils for engines fitted with atomizers. The examination of liquid fuels. Calorimetry.

**MOORE, H. P.** *Textbook of the Materials of Engineering.* By Herbert F. Moore, Research Professor of Engineering Materials, Engineering Experiment Station, University of Illinois. 204 p. 8 vo. il. 1917. \$3.00

A concise, elementary presentation of the physical properties of the common materials used in structures and machines. It presents also brief descriptions of their manufacture and fabrication. Though primarily a textbook for a fundamental college course, it should prove of value also to draftsmen, inspectors, machinists, and others who deal with the materials of engineering.

**MORGAN, G. T.** *Organic Compounds of Arsenic and Antimony.* 375 p. 8 vo. 1918. \$5.50

**CONTENTS:** Preface. Introduction. Cacodyl. Aliphatic arsenicals and antimoniols. Aromatic arsenicals. Atoxyl. Salvarsan. Neosalvarsan. Aromatic primary amines. Luargol. Aromatic antimoniols. Miscellaneous derivatives. Appendix. Bibliography. Indexes.

**MORGAN J. J.** *Blast Furnace Practice.* 46 p. 12 mo. il. 1913. \$0.75

**CONTENTS:** Requirements. Iron ores. Fuel. Flux. Slag. Quantity of slag. Burden; Charge; Round. The blast. Ore mixing. Amount and composition of the iron. Calculation of flux. Heating the blast. Stoves: Drying, heating, changing, and cleaning. Drying the furnace. Filling the furnace, and lighting. Charging the furnace. Descent of the charge. Flushing. Tapping. Hard tapping hole. Running down the beds (casting). Judging the temperature. Controlling the temperature. Temperature and the reduction of silicon. The pig iron. Fuel consumption. Tuyères. Leaky, changing. Cooler, or "Jumbo." Damping down. Blowing out. Index.

**MORGAN, J. J.** *Tables for Quantitative Metallurgical Analysis.* For laboratory use. 8 vo. 1899. \$1.75

**CONTENTS:** Iron ores. Steel. Limestone, boiler incrustation. Blast furnace slag. Coal. Water for technical purposes. Gaseous fuels. Chimney gas. Copper. Zinc. Lead. Alloys. White lead. Atomic weights. Factors. Preparation of equivalent reagents.

**MORGAN, J. LIVINGSTON R.** *Physical Chemistry for Electrical Engineers.* Second edition, revised. 240 p. 8 vo. \$3.00

Presents the generalizations which form the basis of the applications of electricity to the chemical sciences and the electrical applications of chemistry. Discusses fundamental principles, general properties of gases, chemical mechanics, electrochemistry, equilibrium in electrolytes, etc.

**MORRISON, LACEY H.** *Oil Engines, Details and Operation.* 472 p. 8 vo. il. 1910. \$3.00

A modern book on the construction and operation of oil engines. Much of the matter included cannot be obtained elsewhere in book form.

**MORROW, A. S.** *Immediate Care of the Injured.* By Major Albert S. Morrow, M.D. New edition. 362 p. 12 mo. il. 1918. \$2.75

**MORSE, I. H.** *Calculations Used in Cane-Sugar Factories.* A practical system of chemical control for Louisiana sugar-houses and other cane-producing countries. By Irving H. Morse, B.S. Second edition, rewritten. 189 p. 16 mo. 1917. Flexible "Fakrikoid" binding. \$2.00

Contains a practical system of chemical control for cane sugar factories, written for chemists and assistants.

**CONTENTS:** The sampling and analysis of the sugar products. The formula for available sugar mill control. Calculations used in the manufacturing processes. Stock on hand calculations. Laboratory reports. The calculated commercial yield per ton of cane. Manufacturing economics. The purchase of cane by the "unit" method.

**MORTIMER, G.** *Aluminum.* (Pitman's Common Commodities and Industries.) 152 p. 12 mo. il. 1920. \$1.00

**CONTENTS:** Part I.—From Clay to Consumer. Historical. Distribution. Production. Alloys of aluminum and their treatment. Hints on working with aluminum. Part II.—Applications. In automobiles and aircraft. In the chemical industry and Aluminothermics. Electrical. Appendix—A brief note on marketing.

**MOSES, ALFRED J., and PARSONS, CHARLES L.** *Elements of Mineralogy, Crystallography and Blowpipe Analysis.* From a practical standpoint. Fifth edition, revised and enlarged. 631 p. 8 vo. il. 1916. \$4.50

**CONTENTS:** *Crystallography.* Introductory. The "Systems." Their Classes, Forms and Symbols; The Grouping of Crystals and Their Imperfections; The Determination of the Geometrical Constants of a Crystal; *Crystals Optics.* *Blowpipe Analysis.* Apparatus. Blast, Flame, etc.; Operations of Blowpipe Analysis; Summary of Useful Tests with the Blowpipe; Schemes for Qualitative Blowpipe Analysis. *Mineralogy.* Definition and Physical Characters; The Chemical Characters of Minerals; Formation and Occurrence; The Minerals of the Metalliferous Ore Deposits; Minerals Important in the Industries and Not Already Described; Silica and the Rock-forming Silicates, Minerals Used as Precious and Ornamental Stones. *Determinative Mineralogy.* Tables for the Rapid Determination of the Common Minerals. Table of Atomic Weights.

**MUIR, M. M. PATTISON.** *A History of Chemical Theories and Laws.* 567 p. 8 vo. 1906. \$4.00

Sets forth the main lines along which the science of chemistry has advanced, and describes the investigations which have given powerful impulses to the advance of chemical science.

**MULLIKEN, S. P.** *A Method for the Identification of Pure Organic Compounds by a Systematic Analytical Procedure Based on Physical Properties and Chemical Reactions.* In three volumes. By Samuel P. Mulliken, Ph.D., Associate Professor of Organic Chemical Research, Massachusetts Institute of Technology. 1904-1916.

Vol. I. Compounds of carbon with hydrogen and oxygen. 264 p. 8 vo. \$5.00

Contains classified description of about 2300 of the more important compounds of carbon with hydrogen and with hydrogen and oxygen.

**CONTENTS:** Classification of compounds and the general analytical procedure. Ordinal tests (for the elements). The numbered generic and specific tests and analytical tables for the identification of species of the nine genera of colorless compounds constituting sub-order I of order I, these genera containing respectively: Aldehydes; Carbohydrates; Acids, phenolic compounds; Esters; Acid anhydrides and lactones; Ketones; Alcohols; Hydrocarbons, etc. Identification of the colored compounds of order I. Special methods.

Vol. II. Nitrogenous compounds. 327 p. 8 vo. \$5.00

Contains classified descriptions of about 6,000 of the more important compounds of carbon with nitrogen, hydrogen and oxygen.

**CONTENTS:** Classification and general analytical procedure. Generic tests of suborder I. Order II. Numbered tests of order II. Analytical tables and specific characterizations of the compounds of order II.—[(Compounds containing C, N, (H), (O).] Suborder I, Genus I.—Colorless acidic compounds; Division A (solid species). Suborder I, Genus II.—Colorless basic compounds, suborder I, Genus III.—Colorless neutral compounds. Suborder II, colored compounds.

Vol. III. Commercial dyestuffs. Permanently out of print.

**MUNBY, ALAN E.** *Introduction to the Chemistry and Physics of Building Materials.* 365 p. 8 vo. il. 1909. \$2.50

**CONTENTS:** Elementary Science: Natural Laws and Scientific Investigations; Measurement and the Properties of Matter; Air and Combustion. Nature and Measurements of Heat and its Effects on Materials. Chemical Signs and Calculations. Water and its Impurities. Sulphur and the Nature of Acids and Bases. Coal and its Products. Outlines of Geology Building Materials. Classification. Examination and Testing of Stones. Brick and Other Clays. Kiln reactions and the Properties of Burnt Clays. Plasters and Limes. Cements. Theories upon the Setting of Plasters and Hydraulic Materials. Artificial Stone. Oxysulphide Cement. Asphaltes. General Properties of Metals. Iron and Steel. Other Metals and Alloys. Timber. Paints, Oils, Thinners and Varnishes; Bases, Pigments and Driers.

**MUNRO, R. D.** *Steam Boilers: Their Defects, Management, and Construction.* Fifth edition. 157 p. 8 vo. il. \$1.50

**CONTENTS:** Introductory. Explosions caused by overheating of plates. Shortness of water. Deposit. Explosions caused by defective and overloaded safety valves. Area of safety valves. Explosion caused by corrosion. A.—Internal corrosion. B.—External corrosion. Explosions caused by defective design and construction. 1.—Unsupported flue tubes. Collapsing pressure. 2.—Unstrengthened man-holes. 3.—Defective stayng. 4.—Bursting pressures of cylindrical boilers. 5.—Strength of riveted joints (iron). 6.—Factor of safety. Specification of a Lancashire boiler for a working pressure of eighty pounds per inch. Mountings and fittings. Vertical boilers—Introductory; Construction; Construction of Shells; Construction of crown plates and uptake tubes (proportion of); Construction of man-holes, mud-holes, and fire holes; Construction of fireboxes; Mountings; Management; Cleaning. Table of bursting pressures of steel boilers. Table of riveted joints. Specification and drawing of Lancashire boiler for a working pressure of two hundred pounds per square inch. Index.

**MURDOCH, JOSEPH.** *Microscopical Determination of the Opaque Minerals; an aid to the study of ores.* 165 p. 8 vo. 1916. \$2.00

**MURKE, FRANZ.** *Manufacture of Beet Sugar.* 175 p. 8 vo. 1921. \$2.50

The brevity and conciseness with which the main principles of the beet sugar industry are touched upon and treated by the author make this book a valuable addition to the working library of superintendents, engineers and foremen engaged in this field, which is annually increasing in importance.

**CONTENTS:** Harvesting, storing and receiving beets; Fluming, washing and weighing of beets; Cutting of beets; Diffusion process; Pulp; Diffusion juice; First carbonation, Filter presses, After-purification; Evaporation; Thick juice saturation and filtration, First fillmass and remelt sugar; Further operations with the first fillmass; After product operations; Lime kiln, Steffens separation; Osmose process; Boiler house, Miscellaneous; Tables for various calculations

**MURRAY, B. L.** *Standards and Tests for Reagent Chemicals.* 395 p. 8 vo. 1919. \$3.00

A new text filled with the latest and most trustworthy standards of purity for chemicals used in research, analytical, and control laboratories. The following points are covered quite systematically: Name and Common Synonyms, Chemical Formulas, Molecular Weight, Physical Properties, such as Color, Odor, Form, Melting Point, Boiling Point, Congealing Point, Specific Gravity, Solubility and Reaction; Standard of Purity; Uses as a Reagent; Storage and Precautions; Tabular Statement of Maximum of Allowable Impurities; Methods of Testing; Quantitative Methods; References to Literature.

**MURRAY, J. A.** *Chemistry of Cattle Feeding and Dairying.* 343 p. 8 vo. 1915. \$2.50

**MYERS, J. E., and FIRTH, J. B.** *Elementary Practical Chemistry; for medical students and others.* 194 p. 12 mo. il. 1915. \$1.25

A little handbook for use in first year chemistry, or as a help to the man who wishes to brush up on the subject in order to pass an examination.

**NAYLOR, W.** *Trades Waste: Its Treatment and Utilization; with special reference to the prevention of rivers' pollution.* 283 p. 8 vo. il. 1912. \$7.50

This treatise aims at setting forth the causes of rivers' pollution and also the best known practical means of economical prevention. The utilization of trades waste, except where rivers' pollution is concerned, is only touched upon, as to do more would require a special volume. This is intended as a handbook for borough engineers, surveyors, architects and analysts.

**CONTENTS:** Introduction. Chemical engineering. Woollen mill wastes. Tanning and fellmongery. Brewery and distillery waste. Calico bleaching and dyeing. Calico printing and dyeing. Paper-making waste. General chemical waste. Index.

**NEALE, R. E.** *Electricity.* (Pitman's Common Commodities and Industries.) 136 p. il. 1920. \$1.00

**CONTENTS:** Source of electricity; Kinds of current; How electricity is measured and sold; Generating electricity; practice; Transmitting and distributing electricity; Switchgear and substations, Primary and secondary cells; Electricity in homes and industries; Electric lamps and lighting; Electric heating and cooking; Electric motors and their applications; Electric traction; Conveyors; Hoists and Haulages; Electrochemistry and electric furnaces; Electric welding and cutting; Telegraphy and telephony; Electricity in medicine and hygiene.

**NERNST, WALTHER.** *Experimental and Theoretical Applications of Thermodynamics to Chemistry.* By Dr. Walther Nernst, Professor and Director of the Institute of Physical Chemistry in the University of Berlin. 123 p. 12 mo. 1907. \$1.50

**NEAVE, G. B., and HEILBRON, I. M.** *The Identification of Organic Compounds.* 111 p. 8 vo. 1916. \$1.50

**CONTENTS:** Preliminary Tests. Tests for the Elements. Group Reactions. Hydrocarbons. Alcohols. Ethers. Phenols. Aldehydes. Ketones. Acids. Aromatic Sulphonic Acids. Acid Anhydrides. Acid Halides. Acid Amides. Acid Imides. Acid Amides. Esters. Quinones. Carbohydrates. Glucosides. Amines. Nitro Compounds. Nitroso Compounds. Nitriles and Isocyanides. Isocyanates. Ureas and Ureides. Uric Acid Group. Halogen Compounds. Azo Compounds. Pyridine and Quinoline Group. Alkaloids. Sulphur Compounds. Terpenes and Allied Compounds. Albumens and Proteids. Appendix.

**NERNST, W.** *Theoretical Chemistry from the Standpoint of Avogadro's Rule and Thermodynamics.* By Prof. Walther Nernst, Ph.D., of the University of Berlin. Revised in accordance with the seventh German edition. Fourth English edition. 853 p. 8 vo. 1917. \$6.00

A statement of guiding ideas which gives instruction to the student and advice to the investigator who seeks to prosecute his researches in the light of the more recent chemical theories. The author describes thoroughly only those experimental data which possess a

universal significance or which give promise of achieving it; only those hypotheses which have already proved themselves to be helpful; and finally only those applications which are capable of being used systematically, whether their nature is that of calculation or of experiment.

**NEWBIGIN, T. Handbook for Gas Engineers and Managers.** Eighth edition. 596 p. 8 vo. 1915. \$7.50

**CONTENTS:** Coal, Chief kinds of coal; Storage of coal. Analysis of coals and canals; Spontaneous ignition of coal; Gases occluded in coal; Testing of coal for its producing qualities; Specific gravity of coal; Coal distillation; Gas production; Retort house; Retort stack; Retorts; Heating of retorts; Inclined retorts; Machine charging and drawing; Analysis of furnace gases; Retort bench mountings; Hydrocarbon and other gases and vapors; Retort house tools and appliances; Condensation; Naphthalene; Condensers; Exhausters; Steam engines and boilers; Washers; Tower scrubbers; Washer scrubbers; By-pass mains and valves; Tar and liquor wells and tanks; Station meters and other indicating and recording apparatus; Gas holder tanks; Gas holders; Governors; Main pipes; Main pipe joints; Wrought-iron and steel main pipes; Laying of main pipes; Explosions in main pipes; Testing of mains in the ground; Electrolysis of mains and service pipes; Discharge of gas through main pipes; Service pipes and fittings; Public lighting; Consumers' gas meters; Testing meters; Internal fittings; Coal gas testings; Appliances and methods; Tests for impurities; Illuminating power; Foreign and other (proposed) home standards of light; Jet photometers; Specific gravity of gas; Enrichment of coal gas; Public illuminations; Colored fires; Illumination devices; Use of gas for purposes other than lighting; Residual products; Coke and breeze; Coal tar; Ammoniacal liquor; Sulphur recovery; Cyanogen; Coal products; Elementary substances; Chemical and other memoranda; The gas industry; Cost of gas works; Bricks and brickwork; Mortar and concrete; Iron, steel, and other metals; Velocity and force of the wind; Specific gravity and weight of various substances; Office memoranda; Approximate multipliers; Tables of diameters, circumferences, areas of circles and slides of equal squares; Weights and measures; French weights and measures; Decimal system; Money tables

**NEWELL, LYMAN C. Inorganic Chemistry.** Revised edition. 595 p. 12 mo. il. 1916. \$2.00

This revision and extension includes catalysis, osmotic pressure, hydrolysis, colloidal solutions, mass action, reversible reactions, displacement of equilibrium, solubility product, absorption, radioactivity, atomic weights, valence, and molecular weights.

Many other topics have been improved and extended to conform to the advance of science, especially those dealing with the applications of chemistry to the arts and industries, as well as to life itself. Nearly two hundred and fifty new problems and exercises have been inserted. Numerical data have been corrected and the tables have been revised.

**NEWT, G. S. A Manual of Chemical Analysis: Qualitative and Quantitative.** By G. S. Newt, F.I.C., Senior Demonstrator in Chemistry, Royal College of Science, London. Tenth impression. 488 p. 8 vo. 1918. \$3.00

The qualitative section begins with the study of the reactions of the metals of the fifth group as the compounds of these metals are less complex.

In the quantitative analysis, the author has confined himself to a comparatively small number of well-tried typical methods and processes, preferring to describe and explain in tolerably full detail a few quantitative determinations in each of the various sections, such as shall furnish a thoroughly sound course of study, rather than attempt to cover—necessarily in more sketchy outlines—a wider range of subjects.

An important feature of the work is the prominence given to physico-chemical principles, such as the law of mass action, etc., upon which modern methods in analysis are based.

**NICHOLSON, WILLIAM. Smoke Abatement.** A manual for the use of manufacturers, inspectors, medical officers of health, engineers, and others. 256 p. 12 mo. il. 1905. \$2.00

**CONTENTS:** Introduction. General legislation against the smoke nuisance. Local legislation against the smoke nuisance. Foreign laws in regard to smoke abatement. Smoke abatement. Smoke from boilers, furnaces, and kilns. Private dwelling-house smoke chimneys and their construction. Smoke preventers and fuel savers. Waste gas from metallurgical furnaces. Summary and conclusions. Index.

**NIKAIDO, Y. Beet-Sugar Making and Its Chemical Control.** Cloth. 366 p. 8 vo. il. 1909. \$3.50

**CONTENTS:** Definitions of chemical terms. Non-metallic elements; Metallic elements; Organic chemistry. Cane-sugar. Polariscopes and its accessories; Chemical apparatus and general methods for sugar analysis; Practical operation of beet sugar house; Special analysis. Appendix.

**NISSONSON, H. The Arrangement of Electrolytic Laboratories,** with special reference to the requirements of metallurgical practice by H. Nissonson, Director of the Central Laboratory of the Stolberg and Westphalia Company. Authorized translation by Joseph W. Richards, A. C. M. S., Ph. D., Professor of Metallurgy, Lehigh University; Past President of the American Electrochemical Society. 81 p. 8 vo. il. 1905. \$1.50

**NORMANDY, FRANK. A Practical Manual on Sea Water Distillation.** 244 p. 8 vo. il. 1910. \$2.50

**CONTENTS:** Distillation. Types of apparatus. Sea water. Steam fuels. The evaporator. The distilling condenser. Miscellaneous. Working of a distilling apparatus. Gas and oil stoves for evaporators. Multiple distillation.

**NORRIS, JAMES F. Textbook of Inorganic Chemistry for Colleges.** 677 p. 8 vo. il. 1921. \$3.50

The more recent advances in chemistry in both its technical and theoretical aspects are thoroughly covered.

**CONTENTS:** Introduction; Physical and chemical changes; Elements and compounds; Oxygen; Hydrogen; The atomic theory; Chemical equations; Chemical calculations; Measurement of gases; Water; Chlorine; Valence; Hydrochloric acid; Double decomposition; The energy factor in chemical change; Ozone and hydrogen peroxide; Properties of gases; Liquids and solids; Carbon and its oxides; Coal;

Coke; Illuminating gas; Flame; Acids; Bases; Salts; Solutions; Chemical equilibrium; Sulfur and hydrogen sulfide; The oxides and acids of sulfur; Nitrogen and the atmosphere; Ammonia and its derivatives; Nitric acid and the oxides of nitrogen; The determination of atomic and molecular weights; The periodic law; The halogen family; Selenium and tellurium; Phosphorus; Arsenic, Antimony and Bismuth; Some important organic compounds; Silicon and boron; The acid-forming elements and the periodic classification; The physical properties of metals, Alloys; The chemical properties of metals, Metallurgy; Electrochemistry; The properties of oxides; Hydroxides and salts; Sodium and Potassium; Rubidium and Cesium; Calcium; Strontium; Barium and Radium; Beryllium; Magnesium; Zinc; Cadmium and Mercury; Aluminum; Tin and lead; Copper; Silver and gold; Iron; Cobalt and nickel; The platinum metals, Chromium, Molybdenum, Tungsten and uranium; Manganese; Radioactivity; The structure of atoms.

**NORRIS, J. F. Experimental Organic Chemistry.** By James F. Norris. 215 p. 12 mo. il. 1915. \$1.50

**CHAPTER HEADINGS:** I. Laboratory methods. II.—General processes; Hydrocarbons of the Methane series. III.—Unsaturated hydrocarbons. IV.—Alcohols. V.—Acids. VI.—Ethers, esters and anhydrides. VII.—Aldehydes and ketones. VIII.—Amines and amides. IX.—Cyanogen and related compounds. X. Halogen compounds. XI. Compounds containing two unlike substituents. XII. Carbohydrates. XIII. Compounds containing sulphur. XIV. Uric acid and related compounds. XV.—Aromatic hydrocarbons. XVI.—Nitro compounds and sulphonamic acids. XVII. Halogen derivatives of aromatic hydrocarbons. XVIII.—Aromatic amines. XIX. Diazo compounds. XX.—Aromatic alcohols, phenols, and ethers. XXI.—Aromatic acids. XXII. Aromatic aldehydes, ketones, and quinones. XXIII.—Aromatic compounds containing two or more unlike groups. XXIV.—Dyes and dyeing. XXV.—Heterocyclic compounds. XXVI. Proteins. XXVII.—The identification of organic compounds. Appendix. Schiff's reagent.

**NORRIS, J. F. Organic Chemistry.** By James F. Norris, Ph.D., Professor of General Chemistry, Massachusetts Institute of Technology. 579 p. 12 mo. il. 1912. \$3.00

**CONTENTS:** I.—Scope and methods of organic chemistry. II.—Hydrocarbons of the Methane series. III. Hydrocarbons of the Ethylene series. IV.—Hydrocarbons of the acetylene series. Diolenes. V.—Monatomic, saturated alcohols. VI.—Unsaturated alcohols. Polyatomic alcohols. VII.—Monobasic acids. VIII. Polybasic acids. IX.—Ethers, anhydrides and esters. X. Aldehydes and ketones. XI.—Amines and amides. XII.—Cyanogen and related compounds. XIII. Halogen compounds. XIV. Compounds containing two unlike substituents. XV.—Carbohydrates. XVI. Compounds containing phosphorus, arsenic, sulphur, metals. XVII.—The identification of organic compounds and the determination of their structure. XVIII. Uric acid and related compounds. XIX.—Cyclic hydrocarbons. XX. Determination of the structure of aromatic compounds, nitro compounds, and sulphonamic acids. XXI. Halogen derivatives of aromatic hydrocarbons. XXII.—Aromatic amines and other reduction products of nitro compounds. XXIII.—Diazo compounds. XXIV.—Aromatic alcohols, phenols and ethers. XXV. Aromatic acids. XXVI.—Aromatic aldehydes, ketones, and quinones. XXVII.—Aromatic compounds containing two or more unlike groups. XXVIII.—Dyes. XXIX.—Terpenes and camphors. XXX.—Heterocyclic compounds. XXXI.—Proteins.

**NORTH, SYDNEY H. Oil Fuel: Its Supply, Composition and Application.** Second edition, revised. 238 p. 12 mo. il. 1911. \$2.00

**CONTENTS:** The sources of supply. The economic aspect of liquid fuel; chemical composition of fuel oils. Conditions of combustion in oil fuel furnaces. Fuel methods and experiments. Modern burners and methods. Oil fuel for marine purposes. Oil fuel for naval purposes. Oil fuel for locomotives. Oil fuels for road vehicles and motor launches. Oil fuel for metallurgical and other purposes. Oil fuel for domestic purposes. Appendices. Index.

**NORTHROP, EDWIN F. Laws of Physical Science and Epitome of the World's Heritage of the Fundamental of Its Knowledge and Wisdom.** 210 p. Limp. 12 mo. 1917. \$2.25

**CONTENTS:** Mechanics; Hydrostatics; Hydrodynamics and capillarity; Sound, Heat and physical chemistry; Electricity and magnetism; Light, Bibliography and Index.

**NOWAK, CARL A. New Fields for Brewers and Others Active in the Fermentation and Allied Industries.** 300 p. il. 8 mo. 1917. Bibliography pp. 260-300. \$3.00

**CONTENTS:** Introduction; Low alcohol beers; Non malt beverages and fruit juices; The yeast industry and its products; Vinegar; Malt flour, malt extract and diastatic preparations; Industry of breakfast foods; Chemical feeding stuffs; Dairy industry; Industrial alcohol; Mechanical appliances; Bibliography of related literature and patents; General index, including index to sources of supply and advertisers.

**NOYES, W. A. Organic Chemistry for the Laboratory.** Fourth edition, revised. 294 p. 8 vo. il. 1920. \$3.50

**CONTENTS:** Analysis of compounds of carbons; General operations, Hydrocarbons; Alcohols and phenols; Ethers; Aldehydes, Ketones and their derivatives; Acids; Derivatives of acids; Hydroxy and ketonic acids; Carbohydrates; Halogen compounds; Nitro compounds; Amines; Diazo, Hydrazo, Nitroso and other nitrogen compounds; Sulfur compounds; Qualitative examination of carbon compounds.

**NYSTROM, P. H. Textiles; prepared in the extension division of the University of Wisconsin.** 335 p. 12 mo. 1916. \$2.00

**BERG, ERIK V., and JONES, F. D. Iron and Steel. A Treatise on the Smelting, Refining and Mechanical Processes of the Iron and Steel Industry.** 328 p. 8 vo. 1918. \$2.50

**BERG, ERIK V., and JONES, F. D. Machinery's Encyclopedia.** 7 vols. 8 vo. 1917. \$36.00

**OLSEN, J. C. Textbook of Quantitative Chemical Analysis by Gravimetric, Electrolytic, Volumetric and Gasometric Methods.** Fifth edition, revised and enlarged. 576 p. 8 vo. il. 1916. \$4.00

**CONTENTS:** The Balance; General operations; Determination of water. Determination of metals. As oxide; As sulphate and sulphide; As phosphate chromate and chloride. Determination of acids.

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**OLSEN, J. C. (Editor).** *Van Nostrand's Chemical Annual.* Edited by John C. Olsen. A handbook of useful data for analytical manufacturing and investigating chemists and chemical students. Fourth issue, enlarged 785 p. 12 mo. 1918. \$3.00

**CONTENTS.** General (14 tables); Calculation of volumetric analyses (18 tables); Calculation of gas analysis (8 tables); Physical constants of chemical compounds (7 tables); Specific gravity tables (25 tables); Alcohol tables of the bureau of standards; Density, Volume and vapor pressure tables (57 tables); Equivalents of weights and measures (7 tables); Thermochemistry (27 tables); Stoichiometry; New books

**OPPENHEIMER, CARL.** *Ferments and Their Actions.* Translated from the German by C. Ainsworth Mitchell, B.A., F.I.C. 343 p. 12 mo. 1906. \$3.00

**CONTENTS.** General part. Introduction. Definition of the conception of a ferment. The chemical nature of ferments. The influence of external factors upon ferments. The mode of action of ferments. The physiological action of ferment. The secretion of ferments. The importance of ferments to the vital process. The hydrolytic ferments. The proteolytic ferments. Trypsin. Bacteriolytic and haemolytic ferments. Proteolytic vegetable ferments. Coagulating ferments. The saccharifying ferments. Animal diastases. Ferments of the polysaccharides, resembling diastases. Enzymes of the disaccharides. Ferments which decompose glucosides. Other hydrolytic ferments. The lactic acid fermentation. The oxidizing ferments.—Alcoholic fermentation. The biology of alcoholic fermentation. The oxydases. Oxidizing fermentations. Systematic bibliography. Table of abbreviations. Indices.

**OPPENHEIMER, CARL.** *Toxines and Antitoxines.* Translated from the German by C. Ainsworth Mitchell, B.A., F.I.C. 274 p. 12 mo. 1906. \$3.00

**CONTENTS.** General part. Introduction. Behaviour of toxines towards antitoxines. Endotoxines and bacterial proteins.

**Special.** Part I.—The true toxines.—Diphtheria toxine. Diphtheria antitoxine. Tetanus toxine. Botulinus toxine. Pseudocyanus toxine.—Toxine of symptomatic anthrax. Bacterial haemolysins. II.—Endotoxines and other bacterial poisons. Cholera virus. Typhoid virus. Typhoid virus—*Vibrio coli communis*—Dysentery—Plague toxine.—Pneumotoxine—Gonotoxine. Streptococci. Poisons of the tubercle bacillus. Malleine. Anthrax poison. Other bacterial poisons.—Hog cholera. Malignant Oedema. Swine plague.—Metchnikoff's vibrio. Dysentery toxine. III.—The vegetable toxines (phytotoxines).—Ricine. Abrine. Crotine—Robline. Hay fever toxine. IV.—The animal toxines (zootoxines).—Snake toxines. Toad toxine.—Salmander poison.—Spider venom—Scorpion venom. Fish venoms. Toxine of fatigue.—Bibliography. Subject index.

**OSMOND, FLORIS.** *The Microscopic Analysis of Metals.* Edited by J. E. Stead, D. Met., F. R. S., F. I. C. Revised and corrected by L. P. Sidney. Second edition, revised. 313 p. 8 vo. il. 1904. \$3.00

**CONTENTS.** Part I.—Metallography considered as a method of assay. Definition. Subdivisions of metallography. Anatomical metallography. Biological metallography. Pathological metallography. Part II.—The science of polishing. Guiding. Penetration. Scratchings. Finishing. Scaling. Part III.—The micrographic analysis of carbon steels. Rough polishing. Fine polishing. Apparatus employed for photomicrography. Practical applications of metallography. Primary constituents of carbon steels. Micrographic identification of constituents. Detailed examination of selected steels. Segregation in steel and the phenomena of burning, overheating. The macrostructure of steel. Sulphur printing and heat tinting. Conclusions. Theoretical and practical. Pure electro-deposited ferrite. The nomenclature of the microscopic substances and structures of steel and cast iron. Index. 195 photomicrographs, diagrams and figures in the text.

**OSTWALD, W.** *A Handbook of Colloid-Chemistry.* The recognition and theory of colloids and their general physico-chemical properties. By Dr. Wolfgang Ostwald, Privatdozent University of Leipzig. Translated from the third German edition by Dr. Martin H. Fischer, Professor of Physiology, University of Cincinnati, with the assistance of Ralph F. Oesper, Ph.D., Instructor in Chemistry, New York University and Louis Berman, M.D., Staff Physician, Mount Sinai Hospital, New York. Second edition. 284 p. 8 vo. 1918. \$3.00

**OSTWALD, W.** *An Introduction to Theoretical and Applied Colloid Chemistry.* 231 p. 8 vo. il. 1917. \$2.50

**CONTENTS.** FIRST LECTURE—Fundamental properties of the colloid state. Colloidal examples of dispersed systems. Methods of preparing colloid solutions. SECOND LECTURE—Classification of the colloids. The physico-chemical properties of the colloids and their dependence upon the degree of dispersion. THIRD LECTURE—The changes in state of colloids. FOURTH LECTURE—Some scientific applications of colloid chemistry. FIFTH LECTURE—Some technical applications of colloid chemistry. Concluding remarks. Author index. Subject index.

**OWEN, F. A.** *Dyeing and Cleaning of Textile Fabrics.* 253 p. 8 vo. 1900. \$2.50

Contains a list of the various kinds of dyes, the art of fixing coloring matters, and miscellaneous recipes for dyeing cotton, wool, silk; the preparation of cleaning liquor; bleaching; the removing of spots and stains from garments; the washing of silk and cotton; the washing of flannel and other woollen articles; the cleaning of clothes, carpets, etc.; steam cleaning; dry cleaning.

**PAGE, VICTOR W.** *The Modern Gasoline Automobile: Its Design, Construction, Operation.* In the new and revised and enlarged 1918 edition all phases of automobile construction, operation and maintenance are described. Every part of all types of automobiles, from light cyclecars to heavy motor trucks and tractors, are described; not only the automobile, but every item of its equipment, accessories, tools needed, supplies and spare parts necessary for its upkeep, are fully discussed. 1032 p. 8 vo. il. 1918. \$4.00

**PAGE, V. W.** *Storage Batteries Simplified;* operating principles, care and industrial applications, a complete, non-technical but authoritative treatise discussing the developments of the modern storage battery, outlining the basic operation of the leading types, also the methods of construction, charging, maintenance and repair. 280 p. 12 mo. il. 1918. \$2.00

A plainly written book understandable by the average reader.

**PALMER, LEROY S.** *Carotinoids and Related Pigments: The Chromolipins.* (American Chemical Society Monograph.) About 200 p. 8 vo. il. Ready about November 1, 1921.

**CONTENTS.** Introductory. The Chromolipins of the Chloroplast. The Chromolipins of Roots and Tubers. The Chromolipins of Fruits, Flowers, Seeds and Algae. The Chromolipins of Animal Tissues and Fluids. The Chromolipins in Crustacea and other lower animals. Chemical relation between plant and animal chromolipins. Biological relations of plant and animal chromolipins. Methods of isolation. Methods of identification. Quantitative estimation. Functions of Chromolipins in plants and animals.

**PARK, JAMES.** *The Cyanide Process of Gold Extraction.* Fifth edition, revised and enlarged. 347 p. 12 mo. il. 1913. \$3.50

A textbook for the use of mining students, metallurgists, and cyanide operators.

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**PARK, JAMES.** *A Textbook of Practical Assaying; for the use of mining schools, miners, and metallurgists.* 242 p. 8 vo. il. 1915. \$3.00

This is a study for use by the students in the classroom as well as by the miner and metallurgist in the field and laboratory. Prof. Park is an authority in this branch of analytical chemistry and he has the teacher's gift of presenting his knowledge in a most lucid fashion.

**CONTENTS.** Introduction. Part I.—The assay of gold and silver ores; Gold and silver bullion; Platinum, silver and mercury; Lead ores; Tin, antimony and bismuth; Copper ores, slags and alloys; Iron; Manganese and ferro-manganese ores; Zinc ores; Chromite, nickel and cobalt, nickel, and cobalt ores. Part II.—The estimation of chlorine, etc.; of sulphur or sulphuric acid; Detection and estimation of arsenic; Estimation of phosphorus and phosphoric acid; of potassium and the testing of gold ores by cyanide; Detection and estimation of barium, calcium, and strontium; Estimation of tungsten, titanium, thorium, and molybdenum; Analysis of limestone, dolomite, magnesite, and calcareous sandstones; Of Portland cement; Rock analysis for igneous and metamorphic rocks; The analysis of coals. Of a complex sulphide ore; Of soils. Of manures; Of oil shale for petroleum. Technical analysis of water; Estimation of alcohol and sugar; Analysis of milk; Principles of volumetric analysis; Determination of specific gravity; Computation of results. Part III.—Principles of qualitative analysis; Qualitative tests for acids; Index.

**PARR, S. W., and HADLEY, H. F.** *Analysis of Coal with Benzol as a Solvent.* 41 p. 8 vo. 1914. \$0.25

Bulletin No. 76 of the Engineering Experiment Station of the University of Illinois

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**PARR, S. W., and OLIN, H. L.** *Coking of Coal at Low Temperatures.* 39 p. 8 vo. 1915. \$0.25

Bulletin 79 of the Engineering Experiment Station of the University of Illinois.

**PARR, S. W.** *Effect of Storage on the Properties of Coal.* 44 p. 8 vo. 1917. \$0.20

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**PARR, S. W.** *Embrittling Action of Sodium Hydroxide on Soft Steel.* 60 p. 8 vo. 1917. \$0.30

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**PARR, S. W.** *Modification of Illinois Coal by Low Temperature Distillation.* 48 p. 8 vo. 1908. \$0.30

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**PARR, S. W., and KRESSMAN.** *Spontaneous Combustion of Coal.* 87 p. 8 vo. 1911. \$0.45

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**PARR, S. W., and WHEELER, W. F.** *Unit Coal and the Composition of Coal Ash.* 67 p. 8 vo. 1909. \$0.35

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Bulletin 38 of the Engineering Experiment Station of the University of Illinois.



**PARRY, ERNEST J.** *Gums and Resins.* (Pitman's Common Commodities and Industries.) 106 p. il. 12 mo. 1919. \$1.00  
CONTENTS: The true or proper resins; The gum resins, Balsams, Medicinal resins, etc.; The true gums.

**PARRY, ERNEST J.** *Perfumery.* (Pitman's Common Commodities and Industries.) 112 p. il. 12 mo. 1920. \$1.00  
CONTENTS: Introductory; Perfume materials in general; Plant perfume materials; Animal perfumes; Artificial perfumes.

**PARRY, ERNEST J.** *The Chemistry of Essential Oils and Artificial Perfumes.* In two volumes.  
Vol. I. Monographs on Essential Oils. Fourth edition, revised and enlarged. 557 p. 8 vo. il. 1921. \$9.00

CONTENTS: Jungermanniaceae; Coniferae, N. O. Gramineae; Palmae, N. O. Liliaceae; Amygdaliaceae; Indicae, Zingiberaceae; Piperaceae, Cannabaceae; Labiales; Myricaceae, Salicaceae, Urticaceae, Chenopodiaceae; Lauraceae; Myristicaceae, Monimiaceae, Euphorbiaceae, Santalaceae; Aristolochiaceae; Labiatae; Verbanaceae, Convolvulaceae, Primulaceae; Rubiaceae; Oleaceae, Ericaceae, Violaceae, Compositae, Umbelliferae; Myrtaceae, Rosaceae, Cakanthaceae, Rutaceae; Zanthaceae; Anacardiaceae; Burseraceae; Leguminosae; Geraniaceae, Tropaeolaceae; Meliaceae; Cruciferae, Magnoliaceae, Anonaceae, Pittosporaceae; Hamamelidaceae, Cistaceae, Resedaceae; Turneraceae, Canelaceae; Dipsacaceae; Theaceae, Malvaceae; Ranunculaceae.

Vol. II. Constituents of Essential Oils, Synthetic Perfumes and Isolated Aromatics, and the Analysis of Essential Oils.  
Third edition, revised and enlarged. 351 p. 8 vo. il. 1920. \$7.00

CONTENTS: The Essential Oil in the Plant; The Constituents of Essential Oils and Synthetic Perfume Bodies, The Analysis of Essential Oils; Oil of Achillea Millefolium; Oil of Ammoniacum, etc.

**PARRY, L.** *Systematic Treatment of Metalliferous Waste.* 121 p. 8 vo. \$2.50

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**PARRY, L. A.** *The Risks and Dangers of Various Occupations and Their Prevention.* 200 p. 8 vo. 1906. \$3.50

CONTENTS: Occupations accompanied by the generation and scattering of abnormal quantities of dust, Trades in which there is danger of metallic poisoning; Certain chemical trades; Some miscellaneous occupations; Trades in which various poisonous vapors are inhaled, general hygienic considerations.

**PARTINGTON, J. R.** *The Alkali Industry.* Cloth. 320 p. 8 vo. il. 1918. \$3.00

CONTENTS: Introduction, The salt industry; Sulphuric acid; Natural soda and the Leblanc process, The ammonia soda process, Electrolytic processes; Chlorine and derived products, Nitric acid, Ammonia and ammonium salts, The oxidation of ammonia; Utilization and economy of sulphuric magnesium.

**PARTINGTON, JAMES R.** *A Textbook of Thermodynamics* (with special reference to chemistry). 550 p. 8 vo. 1914. \$4.00

CONTENTS: Thermometry and calorimetry. The first law of thermodynamics and some applications. The second law of thermodynamics; Entropy. The thermodynamic functions and equilibrium fluids. Ideal and permanent gases. Changes of physical state. Van der Waals' equation and the theory of continuity of states. Thermochemistry. Gas mixtures. Elementary theory of dilute solutions. General theory of mixtures and solutions. Capillarity and absorption. Electrochemistry. The theorem of Nernst. Kinetic theories in thermodynamics. Expounds the principles of thermodynamics and illustrates their applicability to the various problems of physical chemistry. Chemical problems receive the main consideration and other branches are either briefly treated or omitted.

**PARTRIDGE, C. S.** *Electrotyping.* 213 p. 16 mo. il. 1909. \$2.00

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"The need of a book of this kind has been keenly felt by all scientific men, whether well versed in the German language or otherwise. Germany is headquarters for technical, scientific work, and German scientific publications contain a great amount of valuable matter, some of which is difficult to understand and which the average German-English dictionary translates very inadequately. Dr. Patterson was formerly editor of *Chemical Abstracts*, as well as editor of chemical terms for Webster's New International Dictionary, and thus is peculiarly fitted for preparing a work of this kind. While especial attention is given to this particular need, a fairly voluminous general vocabulary is also included, in which, however, occur many words having a technical as well as a popular meaning, and this meaning is given first, although in ordinary dictionaries it may be omitted or at least not given the prominence it deserves. The book is small enough to go in the pocket, is well bound in flexible covers, and cannot fail to be of everyday use to those who read the German scientific papers, and especially the chemical ones, to keep abreast of the times."—*Indus Rubber World*, May 1, 1917.

**PATTERSON, D.** *Textile Color Mixing.* A manual intended for the use of dyers, calico printers, and color chemists. Second edition, revised. 140 p. 8 vo. il. 1915. \$3.50

**PAUL, J. H.** *Boiler Chemistry and Feed Water Supplies.* 242 p. 8 vo. 1919. \$4.50

CONTENTS: Earth, air and water. Acids, bases and salts. Constituents of natural waters. Scum and Deposits. Softening. Soluble salts. Iron. Carbonic acid. Concentration of waters containing carbonate of soda. Action of carbonic acid on iron. Corrosion. Condensed waters. The superheater. Priming. External deposits. Failure of clean tubes. Water supplies. Appendix; Carbonic acid in London waters.

**PEAKE, R. J.** *Cotton: From the Raw Material to the Finished Product.* (Pitman's Common Commodities and Industries.) 134 p. il. 12 mo. 1919. \$1.00

CONTENTS: Foundation of the English cotton trade; The raw material, The spinning mill. Winding, warping and weaving, Bleaching, printing and dyeing; Market distribution of yarn and cloth, Trade unions, Masters' organizations.

**PEARSON, H. C.** *Crude Rubber and Compounding Ingredients.* A textbook of rubber manufacture. Third edition. 422 p. 8 vo. il. 1918. \$10.00

CONTENTS: Crude rubber, chemical and physical characteristics, sources of supply, Some little known rubbers and bastard or pseudo gums, Coagulation of rubber latex, Vulcanizing processes and ingredients. Plantation Hevea and the optimum cure, Organic and inorganic accelerators, Fillers and ingredients used in rubber compounds, Substitutes for India rubber, natural and artificial, Substitutes for hard rubber and gutta percha, including cellulose products, Resins, balsams, gums, earth waxes, and guttae substances used in rubber compounds, Coloring matters, Acids, alkalis, and their derivatives used in rubber manufacture, Vegetable, mineral and animal oils used in rubber compounds and solutions; Solvents used in commercial and proofing cements, their origin, properties, and methods of use; Miscellaneous processes and compounds for the use in the rubber factory; Synthetic rubber, Vulcanization without sulphur; Reclaimed rubber and its uses; Physical tests and analysis of crude and vulcanized rubber; Primary processes, divisions in rubber manufacture, and typical compounds; Gutta percha. Its sources, properties, manipulation, and uses.

**PEARSON, H. C.** *Rubber Machinery.* 419 p. 8 vo. il. 1915. \$6.00

CONTENTS: The washing of crude rubber, Crude rubber drying, Dry drifting and batching of compound ingredients, Mixing or compounding of rubber, Preparing fabrics for calendaring and spreading. Calenders. Clutches, drives and safety stops for mills and calenders. Extraction of rubber and gutta percha from shrubs, vines, roots and leaves. Extraction of resin from rubber and gutta percha. Reclaiming. Conveyors. Temperature recording and controlling devices. Rubber laboratory equipment.

**PEELE, ROBERT.** *Compressed Air Plant; the production, transmission and use of compressed air, with special reference to mine service.* Fourth edition. 508 p. 8 vo. il. 1920. \$4.50

CONTENTS: Part I—Production of Compressed Air. Introduction, Structure and operation of compressors, The compression of air; Wet compressors; Dry compressors; Compound or stage compressors; Air inlet valves, Discharge or delivery valves; Mechanically controlled air valves and valve motions; Performance of air compressors, Air receivers; Speed and pressure regulators for compressors; Air compression at altitudes above sea level; Explosions in compressors and receivers; Air compression by the direct action of falling water. Part II. Transmission and Use of Compressed Air. Conveyance of compressed air in pipes; Compressed air engines; Freezing of moisture deposits from compressed air; Reheating compressed air; Compressed air rock drills; Hammer drills, Coal cutting machines; Channelling machines; Operation of mine pumps by compressed air; Pumping by the direct action of compressed air; Compressed air haulage for mines; Measurement of air consumption.

**PEELE, R.** *Mining Engineers' Handbook.* Compiled by a staff of specialists, Robert Peele, Professor of Mining Engineering, Columbia University, Editor-in-Chief. 2400 p. 16 mo. il. 1918. Flexible "Fabrikoid" binding. \$7.00  
2-vol. edition, \$8.00

A book prepared to meet the demands of engineers concerned with the installation of plant. Covers mining and metallurgy, and the subjects allied thereto, and data on machinery, power plant, electric transmission, and structural design.

CONTENTS: Mineralogy. Geology and mineral deposits. Earth excavation. Rock excavation. Explosives. Tunneling. Shaft-sinking. Boring. Prospecting. Underground transport. Hoisting plant and ore bins. Drainage and ventilation. Compressed air plant. Electric power. Surveying. Maps and models. Mine organization and accounts. Costs. Wages. Mine air, hygiene. Explosives and accidents. Mining laws. Mine examinations, valuations, and reports. Aerial tramways. Conveyors. Ore dressing. Sampling and testing. Assaying. Amalgamation and cyanidation. Preparation and storage of coal. Mathematics and mechanics. Hydraulics. Thermodynamics. Steam engineering. Electrical engineering. Structural design. Tables.

**PEIRCE, C. A., and CARVER, W. B.** *Handbook of Formulas and Tables for Engineers.* Compiled by Clarence A. Peirce, Assistant Professor in Power Engineering in Sibley College, Cornell University, with Mathematical Sections by Walter B. Carver, Assistant Professor of Mathematics, Cornell University. Second edition. 188 p., pocket size, thin paper, illustrated, flexible binding. 1916. \$2.00

A modern handbook for the engineer and student. This new edition embodies a complete revision of the old material, with the addition of hydraulic formulas, tables of natural logarithms and hyperbolic functions, a paragraph on the laws of exponents, and additional steam tables and charts.

**PELLEW, CHARLES E.** *Dyes and dyeing.* 270 p. 8 vo. 1913. \$2.00

CONTENTS: Introduction; Modern dyestuffs; Direct cotton or salt colors, Theory and practice; Sulphur colors; Indigo or vat colors; Basic colors; Feathers; Leather; Silk; Imitation silk; Tied and dyed work; Stencils; Batch or wax resist; Influence of war on the industry.

**PERCIVAL, G. ARNCLIFF.** *The Electric Lamp Industry.* (Pitman's Common Commodities and Industries.) 112 p. il. 12 mo. 1920. \$1.00

CONTENTS: Historical; Glass manipulation; Equipment; Preparation of filament; The metal filament lamp; Gas filled lamps; Lamp machinery;

The arc lamp; Vapor lamps; Automobile lamps; Special types of lamps; Copping and testing.

**PERKIN, A. G. and EVEREST, A. E.** *The Natural Organic Coloring Matters.* 655 p. 8 vo. 1918. \$10.00  
 CONTENTS: The anthraquinone group; The naphthoquinone group; The benzophenone group; The xanthone group; Flavone group; The chalcone and flavanone groups; Flavonol group; Pyran group; Dihydropyran group; Pyrone or coumarin group; Dicinamoyl-methane group; Diphenyldimethylol group; Tannins; Coumarane group; Indole group; Lichens, lichen acids, and coloring matters derived therefrom; Isoquinoline group; Coloring matters of unknown constitution; Lakes from vegetable coloring matters; Appendices.

**PERKIN, W. H., and KIPPING, F. STANLEY.** *Inorganic Chemistry.* 2 vols. 734 p. 12 mo. il. 1911. Each \$1.25  
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**PERKIN, W. H., and KIPPING, F. STANLEY.** *Organic Chemistry.* New and revised edition. 664 p. 12 mo. il. 1911. 2 vols. Each, \$1.25  
 Set, \$2.50

**PERRIN, JEAN BAPTISTE.** *Atoms.* Authorized translation by D. L. Hammick. 226 p. 8 vo. 1917. \$2.50

**PETERS, E. D.** *Principles of Copper Smelting.* By Edward Dyer Peters. 612 p. 8 vo. 1907. \$5.00

This work is devoted to the underlying principles of the subject, on which Dr. Peters is the acknowledged authority.  
 CONTENTS: Chapter I. Methods and collectors. II. First principles of smelting. III. The principles of roasting. IV. The chemistry of smelting. V. The practice of roasting. VI. Blast furnace smelting. VII. Reverberatory smelting. VIII. Pyritic smelting. IX. A practical study of slags. X. Matte. XI. The production of metallic copper from matte. XII. The refining of copper. XIII. The principles of furnace building. XIV. Applications of thermochemistry. XV. Miscellaneous and commercial.

**PETTIBONE, CHAUNCEY J. VALLETTE.** *An Intermediate Textbook of Physiological Chemistry with Experiments.* 328 p. 8 vo. 1917. \$2.50

**PFANHAUSER, W.** *Production of Metallic Objects Electrolytically.* 162 p. 8 vo. il. 1906. \$1.50

CONTENTS: Historical review; Baths for copper, Galvanoplasty; Physical properties of the copper deposit; Behavior of copper anodes; Constants of the bath and calculation of the amount of deposit; Industrial plants; Particular devices for special purposes; Production of uniform deposits; Manufacture of metallic powders and the like; Manufacture of metallic foil; Production of wire, etc.; Manufacture of bottles of large size; Manufacture of parabolic mirrors; Manufacture of tubes; Electrolytic etching; Electrolytic engraving; Appendix.

**PHILLIPS, F. C. (Editor).** *Methods for the Analysis of Ores, Pig Iron and Steel.* 170 p. 8 vo. il. 1901. \$1.50

CONTENTS: Methods used at the laboratory of the Carnegie Steel Company; Edgar Thompson Steel Works and Furnaces, Braddock, Pa., by C. H. Murray; Methods used at the laboratory of the Ohio Steel Company, Youngstown, Ohio, by J. C. Barrett; Methods used at the laboratory of the Carnegie Steel Company, Lucy Furnace, Pittsburgh, Pa., by Robert Miller; Methods used at the laboratory of the Monongahela Furnace, McKeesport, Pa., by Frederick Crabtree; Methods used at the laboratory of the Pittsburgh Malleable Iron Company, McKees Rocks, Pa., by H. E. Diller; Methods used at the laboratory of the Carbone Steel Company, Pittsburgh, Pa., by G. O. Loeffler; Methods used at the laboratory of the Carnegie Steel Company, Duquesne, Pa., by J. M. Camp; Methods used at the laboratory of the Shenango Valley Steel Company, New Castle, Pa., by A. L. Cromlish; Methods used at the laboratory of the Clinton Iron and Steel Company, Pittsburgh, Pa., by A. B. Harrison; Methods used at the laboratory of the W. Dewees Wood Company, McKeesport, Pa., by R. B. Carnahan; Methods used at the laboratory of the Republic Iron and Steel Company, Youngstown, Pa., by H. L. Brunker; Methods used at the laboratory of the Isabella Furnace Company, Elm, Pa., by F. G. Brunker; Method used at the laboratory of the Cambria Steel Company, Johnstown, Pa., by F. S. Hyde; Methods used at the laboratory of the Fifth Sterling Steel Company, Duquesne, Pa., by A. G. McKenna; Methods used at the laboratory of the Laclede Steel Works, Allegheny, Pa., by Geo. G. Case and C. E. Maule; Methods used at the laboratory of the Park Steel Company, Pittsburgh, Pa., by C. M. Johnson; Methods used at the laboratory of the American Sheet Steel Company, Vandergrift, Pa., by W. H. Gindler; Methods used at the general laboratory of the American Steel Hoop Company, Pittsburgh, Pa., by Henry S. Marsh; Methods used at the laboratory of the American Steel and Wire Company, Shoenberger Steel Works, Pittsburgh, Pa., by C. D. Chamberlain; Methods used at the laboratory of the Pittsburgh Steel Foundry Company, Glassport, Pa., by George F. Hodge; Appendix. The determination of phosphorus in coke and coal, by James M. Camp; The determination of phosphorus in ores, pig iron and steel containing arsenic, by James M. Camp; The determination of alumina as phosphate, by James M. Camp; Blast furnace cinders and their analysis, by James M. Camp; The analysis of chrome and tungsten steels, by A. G. McKenna; A quick method for the determination of carbon in ferrochrome, by A. G. McKenna; The analysis of slags, by A. B. Harrison; The analysis of mill cinder, by A. B. Harrison; A rapid method for phosphorus determination in iron and steel, by James O. Handy; The complete analysis of chrome ore, by A. G. McKenna.

**PHILLIPS, J.** *The Handling of Dangerous Goods.* A handbook for the use of government and railway officials, carriers, shipowners, insurance companies, manufacturers and users of such goods, and others. Compiling notes on the properties of inflammatory, explosive, and other dangerous compounds, and the modes of storage and transport thereof, with official classifications, parliamentary enactments, particulars of recorded accidents, etc. 374 p. 12 mo. il. \$4.50

CONTENTS: Acids, Alkalies, Salts; Gases, *Inflammable liquids*, Coal tar and its products; Crude petroleum and its products; Fixed oils and fats; Essential or volatile oils; Various highly inflammable liquids, *Inflammable solids*; Miscellaneous substances; Common substances liable to "spontaneous" combustion; Explosives; Notes of instructive accidents with various materials, illustrating their nature; Special railway classification, mode of packing, and general regulations for the conveyance of explosives and other dangerous goods, by merchandise trains; Appendix.

**PICARD, H. K.** *Copper, From the Ore to the Metal.* (Pharmaceutical Common Commodities and Industries.) 130 p. il. 1920. 12 mo. \$1.00

CONTENTS: Its properties and sources of supply; The concentration of copper ores; Roasting, The blast furnace; Pyritic smelting; Blast furnace products; The treatment of matte, Smelting in reverberatory furnaces, The Welsh process smelting for "black copper"; Electrolytic refining; Treatment of copper ores by wet processes; Costs and marketing.

**PICKARD, J. A.** *Modern Steel Analysis; a selection of practical methods for the chemical analysis of steel.* 128 p. 12 mo. 1914. \$1.25

**PICKERING, GEORGE FENWICK.** *Aids in the Commercial Analysis of Oils, Fats, and Their Commercial Products.* A laboratory handbook. 133 p. 8 vo. 1917. \$3.00

This concise work, by a former research chemist to the late Dr. Lewkowitch, treats of the technique of sampling, and the examination of physical and chemical properties. There are special chapters on fatty oils, miscible castor oils, boiled oils, blown oils, etc. sulphated oils, neutral fats, foats, etc.; fat splitting and distillation products, glycerine, resins, recovered products and their distillation products; and oils, fats and waxes of the British pharmacopoeia.

**PICKWORTH, C. N.** *Logarithms for Beginners.* Third edition. 58 p. 12 mo. 1913. \$1.00

**PICKWORTH, C. N.** *The Slide Rule. A practical manual.* Twelfth edition. 118 p. 12 mo. 1916. \$1.50

Describes the principle on which the slide rule operates, with detailed instructions for making the various kinds of calculations possible on it.

**PILCHER, RICHARD B.** *The Profession of Chemistry.* 213 p. 12 mo. 1920. \$2.00

CONTENTS: Preface, Synopsis of training and possible careers for a chemist, Preliminary education, Pharmacists and chemists, Professional training, Prospects and conditions of practice, Professional organization, Public analysts and official agricultural analysts, Professional procedure, Industrial chemistry, Chemistry and the state, Teaching, Women in professional chemistry, Chemists in war. Index.

**PILCHER, RICHARD B.** *What Industry Owes to Chemical Science.* With an introduction by Sir George Beilby. 159 p. 12 mo. 1918. \$1.50

CONTENTS: Minerals and metals; Heavy chemicals and alkalis; Coal and coal gas; Dyes, explosives and cellulose; Oils, fats and waxes; Leather, Rubber, Mordant and cement; Refractory materials; Glass and enamels; Pottery and porcelain; Chemical products; Photography, Agriculture and food; Brewing; Alcohol, wines and spirits; Tobacco, inks, pencils, etc.; Gases, Government chemistry.

**PLIMMER, R. H. A.** *Chemical Constitution of the Proteins.* 174 p. 8 vo. 1918. \$2.25

CONTENTS: Hydrolysis; The isolation and estimation of the units, Tyrosine, Cystine, Tryptophane; The other monoamino acids, The isolation of the diamino acids, Protamines, Histones, Albumins and globulins, The vegetable proteins; Phosphoproteins, The scleroproteins, Various proteins, Derivatives of proteins, Analysis of proteins by the distribution of the various kinds of nitrogen; Bibliography.

**PLIMMER, R. H. A.** *Practical Organic and Bio-Chemistry.* 648 p. 8 vo. il. 1915. \$7.00

CONTENTS: Recognition of an organic compound, Isolation and preparation of pure organic compounds, Criteria of their purity, Composition of organic compounds, Identification of an organic compound, Hydrocarbons, Halogen derivatives of the hydrocarbons, Alcohols, Esters, Ethers, Mercaptans and sulphides, Aldehydes, Ketones, The fatty acids, Halogen substitution derivatives of the fatty acids, Acid or acyl chlorides, Acid anhydrides, Unsaturated alcohols, aldehydes and fatty acids, Hydroxy-, keto- and dybasic acids, Amines, Amides; The amino acids; Betaines, Cyanogen compounds, Guanidine and its derivatives, Di-, tri-, and polyhydric alcohols, Fats and oils; Waxes; Lecithins, The carbohydrates, Aromatic compounds, Tannins, Heterocyclic compounds, Ureides, Pyrimidines; Glyoxaline or iminazole derivatives; Purines, Nucleic acids, Purine, of uranic, and its derivatives; Thiophene and its derivatives, Pyridine and its derivatives, Pyridine and its derivatives, Hydroaromatic compounds, Complex aromatic compounds, The anthoxanthins, The anthocyanins, Indole and its derivatives, Quinoline and isquinoline, The alkaloids, The proteins, Enzymes; Individual groups of proteins, The chemical constitution of haem and haematoporphyrin, The pigments of leaves, Metabolism; Composition of the commoner tissues used as food-stuffs for animals; Analysis of normal urine, Analysis of tissues; Tables; List of reagents.

**POESCHL, VICTOR.** *An Introduction to the Chemistry of Colloids; a compendium of colloidal chemistry for students, teachers, and works managers.* Translated by Herbert H. Hodgson, M. A. 114 p. 12 mo. 1910. \$1.75

CONTENTS: General characteristics, Nomenclature, Properties of colloidal solutions, The relation of colloidal solutions to solutions proper and to suspensions, The disperse systems and their classification, Preparation of colloidal solutions, Research methods, Ultramicroscopy, Recent views on the nature of the colloid state, The importance of colloidal chemistry in chemical industry and technology, Literature of the subject, Index.

**POLLEYN, F.** *Dressings and Finishings for Textile Fabrics and Their Application.* Translated from the third German edition by Charles Salter. 279 p. 8 vo. il. 1911. \$3.50

CONTENTS: The dressing process and materials for same; stiffenings and glazes; Adhesive dressings; Materials for soft dressings; Dressings for filling and loading; Antiseptic dressing ingredients; Dyeing and bluing agents; Various dressings; The preparation of dressing; Recipes for dressings; Dressings for linens; Yarn dressings; Laundry glazes; Yarn sizing; Finishing woolen goods; Finishing silk fabrics; Waterproof dressings; Fireproof dressings; Special Finishing process; The application of dressing preparations; Testing dressings.

A description of all materials used in dressing textiles, their special properties, the preparations of the dressings and their employment in finishing linen, cotton, woolen and silk fabrics; fireproof and waterproof dressings from the chemico-physical point of view and also describing the principal machinery employed.



**POOLE, HERMAN.** The Calorific Power of Fuels; with a collection of auxiliary tables showing the heat of combustion of fuels, solid, liquid and gaseous. Third edition, rewritten by Robert Thurston Kent, M.E. 267 p. 8 vo. il. 1918. \$3.00

Since the publication of the 2nd edition (1900) advances in this subject and in the use of new fuels (fuel oils, gasoline, denatured alcohol, and blast furnace, natural, producer, and coke-oven gases) and in methods of investigation, have been of such great importance as to warrant a thorough rewriting. New material is based largely upon studies made by the United States Geological Survey and the Bureau of Mines. Chapter 11 describes the analysis and measurement of the products of combustion. Appendix contains the boiler test code of the American Society of Mechanical Engineers.

**PORRITT, B. D.** The Chemistry of Rubber. 104 p. 12 mo. 1914. \$1.00

CONTENTS: The Properties of Crude Rubber; Constitution and Derivatives; Methods of Vulcanization; Theories of Vulcanization; Waste Rubber and Its Utilization; Synthetic Caoutchouc; Bibliography.

**PORTER, HORACE C.** Coal Carbonization. (American Chemical Society Monograph.) About 475 p. 8 vo il. Ready about November, 1921.

CONTENTS (Tentative) Fuel and industry, relation to progress and civilization. Economics of fuel utilization. Central stations for the generation and distribution of power and heat. Gas and coke industries. Nature of coal and coal carbonization. Industrial coal carbonization. Coke ovens of the non-recovery type. By-product recovery coke ovens. Coal gas retorts of the horizontal and inclined type. Coal gas retorts of the vertical type. Miscellaneous carbonizing processes. Low temperature carbonization. By-product recovery systems. Coke. Special cokes. Tar and oils. Ammonia and cyanides. Coal gas. Sulphur in carbonization. Appendix.

**POTTS, HAROLD E.** Chemistry of the Rubber Industry. 163 p. 8 vo. 1912. \$2.50

(Author is a member of the International Rubber Testing Committee.)

CONTENTS: The colloidal state. Suspensoid colloids. Emulsoid colloids. Raw rubber. Gutta-percha and balata. Mixing. Control. Compounding ingredients. Vulcanization. Vulcanized rubber.

Aims at bridging the gap between pure chemistry and manufacturing processes. It is intended to explain to the chemist the chief properties of the material with which he has to deal and the chief lines in which his work may run. It is also intended to explain to the rubber technologist the nature of the problems with which the rubber chemist is concerned and to make clear not only the difficulties, but also the possibilities of chemical routine and research. The production and manufacture of rubber are considered, not for the sake of their own technique, but for their bearing on chemical work. The analytical processes of most importance are critically described and explained.

**POYNTING, J. H., and THOMPSON, J. J.** A Textbook of Physics; Electricity and Magnetism. Parts I and II. Static Electricity and magnetism. 345 p. 8 vo il. 1914. \$4.00

The present volume contains an account of the chief phenomena of electric and magnetic systems when they are respectively charged and magnetized. The effects of changes in the systems are only considered statistically, after the changes are effected, and the systems have become steady again. The phenomena accompanying the progress of change belong to electric current or electro-magnetism and will be treated in another volume.

**POYNTING, J. H., and THOMPSON, J. J.** A Textbook of Physics; Heat. Fourth edition. 354 p. 8 vo il. 1911. \$5.00

CONTENTS: Temperature. Expansion of solids with rise of temperature. Expansion of liquids. Expansion of gases. Circulation and convection in liquids and gases. Quantity of heat. Specific heat. Conductivity. The forms of energy. Conservation of energy. Mechanical equivalent of heat. First law of thermodynamics. The Kinetic theory of matter. Change of state—liquid—vapour. Change of state—solid—liquid. Water in the atmosphere. General account of radiation. Theory of exchanges. Radiation and temperature. Thermodynamics. Thermodynamics of isothermal and adiabatic changes. Thermodynamics of radiation. Index.

**POYNTING, J. H., and THOMPSON, J. J.** A Textbook of Physics; Sound. Fifth edition, revised. 164 p. 8 vo il. 1914. \$3.50

CONTENTS: The nature of sound and its chief characteristics. The velocity of sound in air and other media. Reflection and refraction of sound. Frequency and pitch of notes. Resonance and forced oscillations. Analysis of vibrations. The transverse vibrations of stretched strings or wires. Pipes and other air cavities. Rods. Plates. Membranes. Vibrations maintained by heat. Sensitive flames and jets. Musical sound. The superposition of waves. Index.

**POYNTING, J. H., and THOMPSON, J. J.** A Textbook of Physics; Properties of Matter. Fifth edition. 223 p. 8 vo. il. 1900. \$4.00

This book is intended chiefly for the use of students who lay most stress on the study of the experimental part of physics, and who have not yet reached the stage at which the reading of advanced treatises on special subjects is desired. The mathematical methods adopted are very elementary. A number of alterations have been made in this new edition.

CONTENTS: Weight and mass. The acceleration of gravity. Its variation and the figure of the earth. Gravitation. Elasticity. Strain. Stresses. Relation between stresses and strains. Torsion. Bending of rods. Spiral springs. Impact. Compressibility of liquids. The relation between the pressure and volume of a gas. Reversible thermal effects accompanying alterations in strains. Capillarity. Laplace's theory of capillarity. Diffusion of liquids. Diffusion of gases. Viscosity of liquids. Index.

**PRANKE, E. J.** Cyanamide; manufacture, chemistry and uses. 112 p. 8 vo. 1913. \$1.50

CONTENTS: Discovery and manufacture of cyanamide; Preparation and properties of cyanamide; Analytical methods; Storage of cyanamide; Decomposition of cyanamide in the soil; Retention of cyanamide nitrogen in soil; Nitrification of cyanamide; Nitrogen; Toxicity of fertilizers; Agricultural use of cyanamide; Making fertilizer mixtures with cyanamide; Permanganate availability of cyanamide; Fire and water hazard of cyanamide.

**PRESCOTT, A. B., and JOHNSON, O. C.** Qualitative Chemical Analysis; a guide in qualitative work, with data for analytical operations, and laboratory methods in inorganic chemistry. Seventh edition. Thoroughly revised by John C. Olsen, A.M., Ph.D. 440 p. 8 vo. 1916. \$4.00

This new edition retains all of the excellent features which have given this book such extended use in the past, both as a class room and as a reference text, while adding the results of recent progress in the science. All data and tables have been brought up to date.

CONTENTS: PRINCIPLES OF ANALYTICAL CHEMISTRY.—The chemical elements and their atomic weights. Periodic system. Classification of the metals as bases. Commonly occurring acids. Operations of analysis. Solution and ionization. Order of laboratory study. THE METALS.—The silver, tin, copper, iron, zinc, calcium and alkali groups. THE NON-METALS.—Systematic examination.

**PRICE, G. M.** Modern Factory; safety, sanitation and welfare. 524 p. 8 vo. 1914. \$3.00

CONTENTS: The factory. Factory fires and their prevention. Factory accidents and safety. Lights and illumination. Sanitation. Employers' welfare work. Air and ventilation in factories. Industrial dusts and dusty trades. Industrial poisons. Factory legislation. Factory inspection.

**PRICE, T. S.** Per- Acids and Their Salts. 123 p. 8 vo. 1912. \$1.60

CONTENTS: Introduction. Peroxyphosphates and peroxysulfates; Peroxyphosphates, Peracetic acid and perphosphoric acid, Peritanates; Perazones and perantannates; Peroxyphosphates, peroxymalates and perantannates; Perchromates, Peroxymalates, Pertungates and Perantannates; Literature references, Index.

**PRICE, W. B., and MEADE, R. K.** Technical Analysis of Brass and the Non-Ferrous Alloys. 376 p. 12 mo. 1911. \$3.00

CONTENTS: PART I. Introduction. Engineering Alloys. Apparatus for electrochemical analysis. PART II. DETERMINATION OF THE METALS. Aluminum. Antimony. Arsenic. Bismuth. Cadmium. Copper. Iron. Lead. Magnesium. Manganese. Nickel and cobalt. Phosphorus. Silica. Sulphur. Tin. Zinc. PART III. ANALYSIS OF ALLOYS. Aluminum alloys. Babbitt alloy. Babbitt and fusible metals. Brass. Bronze. Copper alloys. Electrolytic assay. PART IV.—CONTROL AND ANALYSIS OF PLATING SOLUTIONS. Brass, copper, zinc, and silver cyanide solutions. Nickel and gold solutions. Electrolytic determinations. Control of solutions. International atomic weights. Table of factors for use in alloy analysis.

**PRIDEAUX, E. B. R.** The Theory and Use of Indicators. An account of the chemical equilibria of acids, alkalies and indicators in aqueous solution, with applications. Diagrams. 182 p. 8 vo. 1917. \$5.00

CONTENTS: Equilibria of acids, bases and salts, and the physical methods of determining acidity and alkalinity; Light absorption in the visible spectrum and colorimetry; Theories of color in their relation to the ionic theory, chemical constitution and the formation of salts; Color of indicators as a function of hydron concentration; Determination and use of indicator constants; Preparation and use of solutions of standard hydron concentration; Applications. Course of neutralization and the theory of titration. Solution equilibrium and titration of some acids; List of principal indicators, with absorption spectra.

**PROCTER, H. R.** Leather Industries Laboratory Book of Analytical and Experimental Methods. 460 p. 8 vo. il. 1919. \$10.00

**RACE, JOSEPH.** Chlorination of Water. 158 p. 12 mo. il. 1918. \$1.50

CONTENTS: Historical; Modes operanti; Dosage; Bacteria surviving chlorination; Complaints; Bleach treatment; Liquid chlorine; Electrolytic chlorine and hypochlorites; Chloramine; Results obtained; Appendix.

**RACE, JOSEPH.** Examination of Milk for Public Health Purposes. 224 p. 12 mo. il. 1918. \$1.75

This book is primarily intended as a practical handbook for those engaged in the chemical and bacteriological examination of milk for public health purposes, and is also intended to be of material assistance to students and others who have previously assimilated the fundamentals of bacteriological technique. Chemical methods and data have been included which will enable the examiner to interpret the results obtained.

CONTENTS: Constituents of milk. Normal composition of milk. Chemical examination. Bacteria in milk. Enumeration of bacteria in milk. Excremental organisms. Pathogenic organisms. Cells, dirt and debris. Miscellaneous. Appendix. Name index. Subject index.

**RALSTON, OLIVER C.** Electrolytic Deposition and Hydrometallurgy of Zinc. Author is metallurgist, Hooker Electrochemical Co., Niagara Falls, N. Y. 201 p. 8 vo. 46 il. 1921. \$3.00

A thorough and authoritative presentation of present practice, and of the underlying theory of leaching, purification and electrolysis. Special emphasis is placed in this book on methods of purification of the solutions before electrolysis.

CONTENTS: Introduction. History of zinc hydrometallurgy; Roasting zinc ores. Sulphate solutions; Leaching and purifying; Electrolysis of zinc sulphate solutions. Chlorinating zinc ores and purifying solutions; Electrolysis of zinc chloride; Electrolytic zinc refining. Melting electrolytic zinc. Examples of practice; Zinc chemicals; Economics in zinc hydrometallurgy.

**RAMBOUSEK, JOSEF.** Industrial Poisoning from Fumes, Gases and Poisons of Manufacturing Processes. Translated by T. M. Legge. 360 p. 8 vo. 1913. \$5.00

**RAMSAY, A. R. J., and WESTON, H. C.** Artificial Dyestuffs; their nature, manufacture, and uses. 212 p. 8 vo. 1918. \$1.60

**RAMSAY, A. R. J., and WESTON, H. C.** Manual of Explosives. 127 p. 12 mo. 1916. \$1.00

**RAMSAY, W.** The Gases of the Atmosphere; the history of their discovery. 314 p. 12 mo. 1916. \$3.00

**RAND Metallurgical Practice, Text-book of.** Designed as a "Working Tool" and practical guide for metallurgists upon the Witwatersrand and other similar fields. In two volumes, each complete in itself and sold separately.

This work has been written by a body of technical men actively engaged in current metallurgical practice upon the Witwatersrand. Each has based his treatment, of the special branch of the subject with which he has dealt, upon the experience gained and the investigations made during the course of his daily duties. Every effort has been made to describe in full detail such working points as are likely to prove of practical service to mill and cyanide men and to mechanical engineers; designing or maintaining the plant employed, the fundamental principles on which present practice has been based and from which further improvements may be anticipated, have been given due consideration.

**VOLUME I CONTENTS:** Introduction. The Witwatersrand and its mines. Sorting and breaking. Stamp-milling. Tube-milling. Treatment of sand. Slime. Precipitation. Clean-up and smelting. Assaying. On testing. **Section 1.**—Testing cyanide solutions. **Section 2.**—Testing of supplies. **Section 3.**—Testing of gold ore. **Section 4.**—Testing a plant in operation. Chemistry of basket ore treatment. Tables. 468 p. 8 vo. il. 1912. \$7.50

**VOLUME II CONTENTS:** Section 1.—The design and construction of reduction plants. General consideration. Sorting and breaking plant. Crushing plant. Amalgamating plant. The mill clean-up plant. The cyanide plant. The power supply. Estimating. The cost of reduction plants. **Section 2.**—The transport of materials. Bibliography and references. Index. 438 p. 8 vo. il. 1912. \$7.50

**RANDAU, P.** Enamels and Enamelling. An introduction to the preparation and application of all kinds of enamels for technical and artistic purposes. Translated by Charles Salter. 196 p. 8 vo. il. 1901. \$5.00

**CONTENTS:** Composition and properties of glass; Raw materials used in enamel manufacture; Substances for producing opacity; Fluxes; Pigments; Decolorizing agents; Testing the raw materials and enamel mass; Subsidary materials; Preparing materials for enamel making; Mixing the materials; The preparation of various technical enamels.

**RAWSON, CHRISTOPHER; GARDNER, WALTER M., and LAYCOCK, W. F.** A Dictionary of Dyes, Mordants, and Other Compounds Used in Dyeing and Calico Printing. 372 p. 8 vo. 1901. \$7.50

A practical work for use in the laboratories of color chemists, dyers, and manufacturers. It comprises a general description of dyes, mordants, and other substances employed in dyeing and calico printing, with their properties and uses; and wherever possible the methods of examining and assaying these various bodies.

**READ, T. T. (Editor).** Recent Copper Smelting. 459 p. 8 vo. 1914. \$2.50

**REDGRAVE, GILBERT R., and SPACKMAN, CHARLES.** Calcareous Cements. Second edition, revised. 310 p. 8 vo. il. 1905. \$4.50

Their nature, manufacture, and uses, with some observations upon cement testing.

**CONTENTS:** Introduction. The burning of lime. Retrospective and historical review of the cement industry. The early days of Portland cement. The composition of Portland cement. The chemical analysis of cement raw materials, Portland cement, and lime. Analyses of raw materials and Portland cements, calculations of proportions, rapid methods of making determinations, and specific gravity. Preparation of the mixture of raw materials by the wet method. The dry process. Treatment of the raw materials by dry methods. The dry process: Crushing, grinding, and auxiliary machinery. The calculation of the cement mixture. Revolving or rotary kilns. Grinding, storing, and packing the cement—Dust collecting contrivances. The composition of mortar and concrete. Cement testing. Accelerated tests for constancy of volume. The employment of slags for cement making. Scott's cement, scientific cement, cements produced from sewage sludge and the refuse from alkali works, and Sidero cement. The plaster cements. Specifications for Portland cement. Appendix. A.—Kirkland's tests of mortar and Scientific cement. B.—The effects of sea water on cement. C.—German standard tests. D.—Report of a committee of the American Society for testing materials on a standard specification for cement. E.—The cost of cement manufacture. F.—Dorking stone lime. Index.

**REDWOOD, BOVERTON.** Petroleum. A Treatise on the Geographical Distribution and Geological Occurrence of Petroleum and Natural Gas; the physical and chemical properties, production and refining of petroleum and ozokerite; the characters and uses, testing, transport, and storage of petroleum products, and the legislative enactments relating thereto; together with a description of the shale oil and allied industries, and a full bibliography. Third edition, revised. In three volumes. 8 vo. Cloth. 1913. \$18.00

Vol. I. 400 p.

**CONTENTS:** Historical account of the petroleum industry; Geological and geographical distribution of petroleum and natural gas; Physical and chemical properties of petroleum and natural gas; Origin of petroleum and natural gas; Production of petroleum, natural gas, and ozokerite.

Vol. II. 425 p.

**CONTENTS:** Refining of petroleum; Shale oil and allied industries; Transport, storage, and distribution of petroleum; Testing of crude petroleum, petroleum, and shale products, ozokerite and asphalt; Uses of petroleum and its products.

Vol. III. 389 p.

**CONTENTS:** Statutory, municipal, and other regulations relating to the testing, storage, transport, and use of petroleum and its products; Statistics; Marine transport of petroleum; Import duties levied on United States petroleum; Thames conservancy.

**REDWOOD, BOVERTON, and EASTLAKE, ARTHUR W.** Petroleum Technologists' Pocket-book. 454 p. 16 mo. il. 1915. \$2.75

A pocket-book of ready reference for the office, the factory, or in the field. As in hardly any other profession the oil man needs continually to refer to important data. It is in compact form with a complete index, which makes it possible to find the desired information without loss of time.

**CONTENTS:** General arrangement. General information about petroleum. Geological, physical and chemical. Production. Refining. Transport, storage, and testing. Used. Weights and measures. Miscellaneous. Statistics.

**REDWOOD, I. I.** Theoretical and Practical Ammonia Refrigeration; a work of reference for engineers and others employed in the management of ice and refrigeration machinery, by Ilyd I. Redwood, Assoc. Mem. Amer. Soc. M. E., Mem. Soc. Chemical Industry. Seventh edition. 145 p. 25 pages of tables, 12 mo. 1914. \$1.00

**CONTENTS:** Introductory remarks. British thermal unit. Mechanical equivalent of a unit of heat. Specific heat. Latent heat. Absolute pressure. Absolute temperature. Theory of refrigeration. Freezing by compressed air and by ammonia. Characteristics of ammonia. Anhydrous ammonia. Description of plant. Construction details. Lubrication. Valves. The separator. The condenser. The receiver. Brine tank. Working details. Method of charging with ammonia. Jacket water. Condensing water. Loss due to heating ammonia. Excess condensing pressure and its variation. Cooling directly by ammonia. Brine. Freezing point of brine. Methods of making. Regulation of brine temperature. Determination of refrigeration efficiency, equivalent of a ton of ice. Loss in compressors. Distribution of mercury wells. Examination of working parts. Indicator diagrams. Calculation of the maximum capacity of a machine. Preparation of anhydrous ammonia. Condenser worm. Best test for ammonia. Tables. Index.

**REMINGTON, JOSEPH P.** The Practice of Pharmacy. New eighth edition. Based on the Ninth Decennial Revision of the United States Pharmacopoeia. 1987 p. 8 vo. 1917. \$8.00

A treatise on the modes of making and dispensing official, unofficial, and extemporaneous preparations, with descriptions of their properties, uses, and doses. Professor Remington, by virtue of his labours on the new Pharmacopoeia as Chairman of the Committee of Revision, is equipped to make this the latest edition of his masterpiece, the most complete compendium of pharmaceutical practice in the world.

**RICHARDS, C. B.** Entropy-Temperature and Transmission Diagrams for Air. 20 p. 8 vo. 1913. \$0.25

Bulletin 63 of the Engineering Experiment Station of the University of Illinois

**RICHARDS, J. W.** Metallurgical Calculations. By Prof. Joseph W. Richards, head of the Department of Metallurgy, Lehigh University. 3 vols. 8 vo. 1918.

These three volumes cover the basic principles of chemical calculations, and their application to metallurgical problems. These are explained in a manner as simple as possible. Lists of chemical and physical constants used in ordinary metallurgical practice are given.

**Part I.** Introduction. Chemical and Thermal Principles. Problems in Combustion. Fourth edition. 238 p. 8 vo. \$2.50

**CONTENTS:** Introduction. The chemical equation. Fourth application of thermochemistry. The use of the thermochemical data. Thermochemistry of high temperatures. Thermophysics of chemical compounds. Artificial furnace gas, chimney-draft and forced draft. Conduction and radiation of heat.

**Part II.** Iron and Steel. Second edition. 236 p. 8 vo. \$2.50

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**Part III.** The Metals Other than Iron. (Non-ferrous Metals.) Second edition. 197 p. 8 vo. \$2.50

**CONTENTS:** Roasting and smelting copper ores. Electrometallurgy of copper. The volatility of lead. Roasting lead ores. Reduction of roasted ore. Electrometallurgy of lead. Electrolytic refining of silver bullion. Volatilization of silver and gold. Roasting of sphalerite. Reduction of zinc oxide. Electrolytic furnace. Reduction of alumina.

Parts I, II and III, bound in one volume, 676 p., 8 vo. \$6.00

**RICHARDS, R. H.** Textbook of Ore Dressing. By Robert H. Richards, S.B., LL.D., Professor of Mining Engineering and Metallurgy, Emeritus, Massachusetts Institute of Technology, and author of "Ore Dressing." Assisted by Eaf S. Bardwell and Edwin G. Goodwin. 702 p. 8 vo. il. 1909. \$5.50

**CONTENTS:** General principles. Preliminary breaking. Rolls. Stamp mills. Gravity stamps and amalgamation. Grinders other than gravity stamps. Laws of crushing. Preliminary washing and hand sorting. Preparation of the crushed ore for concentration. Principles of screening and classifying. Coarse sand concentrating. Fine sand concentrating. Slime concentrating. Miscellaneous processes of separation. Accessory apparatus. Mill principles and processes. General consideration. Coal dressing.

**RICHARDS, W. A., and NORTH, H. B.** A Manual of Cement Testing. For the use of engineers and chemists in colleges and in the field. 147 p. 12 mo. il. 1912. \$1.50

**CONTENTS:** Classification, composition, manufacture. Sampling. Fineness specific gravity. Normal consistency. Constancy of volume. Tensile strength, compressive strength and transverse tests. Sand and stone. Laboratory equipment. Part played by chemical analysis. Preparation of sample for analysis. Analysis of cement, limestone, marl, slag and clay. Standard specifications for Portland cement.

This laboratory manual is intended to assist in bringing about uniformity in the testing of cement. The authors have endeavored to present, in a somewhat condensed form, such directions as will en-

As a student in the laboratory or an operator in the field office to interpret correctly the Standard Methods of Testing and Specifications for Cement, as published by a committee of the American Society of Civil Engineers, American Society for Testing Materials, Association of American Portland Cement Manufacturers and the American Railway Engineers and Maintenance of Way Association. Sufficient detail is given to enable all students to learn the same manipulations and thus be able to perform each test in a certain well-defined and similar manner. Mr. Richards is a practical engineer and has been engaged in practical engineering work and teaching of engineering subjects for a number of years, and Dr. North has made a special study of cement and for two years was a student of Prof. Henri Le Chatelier, the great French authority on cement.

**RICHARDSON, CHARLES H.** Building Stones and Clays. A handbook for architects and engineers. 437 p. 8 vo. il. 1917. \$5.50

A profusely illustrated textbook by the Professor of Mineralogy in Syracuse University. Has a chapter on artificial stone. "The object has been to furnish an elementary knowledge of the essential minerals in building stones and the objectionable minerals they sometimes contain; to show the chief characteristics of the more important building stones; to give their geographical distribution and range in compressive strength; to impart some information as to the physical and chemical properties of clays and the products that may be manufactured from them."—Preface.

**RICHARDSON, O. W.** Electron Theory of Matter. 614 p. 8 vo. 1914. \$4.50

**RICHMOND, HENRY DROOP.** Dairy Chemistry. Third edition, revised. A practical handbook for dairy chemists and others having control of dairies. 502 p. 8 vo. il. 1920. \$8.00  
CONTENTS: Introductory. The constituents of milk. The analysis of milk. Normal milk: Its adulteration and alterations and their detection. The chemical control of the dairy. Biological and sanitary matters. Butter. Other milk products. The milk of mammals other than the cow. Standardization and calibration of apparatus. Appendix. Useful tables. Index.

**RICHMOND, HENRY DROOP.** The Laboratory Book of Dairy Analysis. Second edition, revised. 106 p. 8 vo. il. 1914. \$1.25  
CONTENTS: Introduction. The analysis of milk. The analysis of liquid milk products. The application of analysis to the solution of problems. The analysis of butter. The analysis of cheese. Tables of calculation. Appendix. Index.

**RICHTER, VICTOR v.** Organic Chemistry, or Chemistry of the Carbon Compounds. Vol. I, Chemistry of the Aliphatic Series. Newly translated and revised from the German edition by Percy E. Spielmann. Second edition, revised. Cloth. 735 p. 8 vo. 1919. \$7.00

CONTENTS: Introduction; Fatty compounds; Aliphatic substances or methane derivatives; Chain or acyclic carbon derivatives; Hydrocarbons; Halogen derivatives of the hydrocarbons; Oxygen derivatives of the methane hydrocarbons; The monohydric alcohols and their oxidation products; Dihydric alcohols or glycols and their oxidation products; Carbonic acid and its derivatives; Trihydric alcohols; Glycerols and their oxidation products; Tetrahydric alcohols and their oxidation products; The pentahydric alcohols or pentitols and their oxidation products; Hexa- and polyhydric alcohols and their oxidation products; Animal substances of unknown constitution.

**RICKARD, T. A., compiler and editor.** The Flotation Process. Compiled and edited by T. A. Rickard. 364 p. 8 vo. il. 1916. \$2.00

Fifty thousand tons of ore are being treated daily in the United States by the frothing, or bubble, levitation method. In this volume Mr. Rickard, the well-known authority, has brought together and carefully edited nearly forty articles written by experts for the *Mining and Scientific Press* during the past year. There are also many references to the history of the art, including descriptions of significant patents.

**RICKARD, T. A., and RALSTON, O. C.** Flotation. 416 p. 8 vo. il. 1917. \$3.00

"This is a report on recent progress in the application of flotation to metallurgical practice. It does not pretend to be a last word. No final treatise can be written on an art that is growing as flotation has grown during the last two or three years. We have tried to give the worker the latest obtainable information on the technology of the subject."—Preface.

**RICKARD, T. A.** Concentration by Flotation. By T. A. Rickard, Mining Engineer and Editor, The Mining and Scientific Press, and others. 1921. \$7.00

A compilation of articles appearing in the Mining and Scientific Press, during the years of 1905 to 1920. Five of the articles were reprinted in a book entitled, "The Flotation Process," by T. A. Rickard, published in 1916, and seventeen of them appeared in "Flotation," by T. A. Rickard and O. C. Ralston, published in 1917. This new volume besides the twenty-two articles already mentioned, contains eighteen later articles on the subject, and serves as a convenient compendium of the principal literature on the technology of the process.

CONTENTS: A glossary of flotation. The history of flotation (T. A. Rickard); Principles of flotation (T. A. Rickard); The flotation of gold and silver minerals (T. A. Rickard); Flotation litigation I. (T. A. Rickard); Flotation litigation, II. (T. A. Rickard); Testing ores for the flotation process (O. C. Ralston and Glenn L. Allen); Testing ores for flotation (James M. Hyde); Flotation in a Mexican mill (R. T. Miehler); Flotation at the Central Mine, Broken Hill (James Hebbard); Cyanide treatment of flotation concentrate (Charles Butters and J. E. Clennell); Disposal of flotation residue (W. S. Shellheiser); Flotation principles (C. Terry Durrell); The theory of flotation (H. Hardy Smith); The flotation of minerals (Robert J. Anderson); Principles underlying flotation (Joel H. Hildebrand); Molecular forces and flotation (Will H. Coghill); The armor in flotation (Will H. Coghill); Colloids (E. E. Free); Differential flotation (O. C. Ralston); Flotation at the Calaveras Copper (Hallet R. Robbins); The disposal of flotation products (Robert S. Lewis); Mechanical development in flotation (O. C. Ralston); The flotation of oxidized ores (Glenn L. Allen and Oliver C. Ralston); Flotation at Cobalt, Ontario (W. E. Simpson); Cascade method of froth-flotation (H. Hardy Smith); Flotation of semi-oxidized silver ore (E. J. Atkinson); The development of flotation at the Broken Hill Proprietary Mine, Australia (Edwin T. Henderson); The Bradford

process at Broken Hill (Edwin T. Henderson); The flotation of galena at the Central Mine, Broken Hill (R. J. Harvey); Recovery of copper from flotation by leaching (Percy R. Middleton); The Horwood process as applied to the copper smelting of the Afterthought Mine (A. H. Heller); A modification of Horwood's process for the treatment of copper-antimony ores (H. L. Hazen); The smelting of flotation concentrate at Garfield (T. A. Rickard); Flotation practice of the Utah Copper Company (T. A. Rickard); Froth flotation at Broken Hill (C. C. Freeman); A résumé of literature on the theory of flotation, with critical notes (H. R. Adam).

**RICKARD, T. A.** Technical Writing. 178 p. 12 mo. 1920. \$1.50

CONTENTS: General principles. Naturalness. Clearness. Precision. Superlatives and other diluents. It, one, with, while. The relative pronouns. Prepositions and prepositional verbs. Hyphens and compound words. Slovenliness. Jargon. Construction of sentences. Composition. Style. Index. Based on lectures at the University of California.

**RIDEAL, ERIC K., and TAYLOR, H. S.** Catalysis in Theory and Practice. 496 p. 8 vo. 1919. \$6.00

**RIDEAL, SAMUEL.** Glue and Glue Testing. 196 p. 8 vo. 1914. \$5.00

CONTENTS: Constitution and properties. Raw materials and manufacture; Uses of glue; Gelatine; Glue testing; Commercial aspects.

**RIDEAL, SAMUEL.** The Carbohydrates and Alcohol. 234 p. il. 8 vo. 1920. \$4.00

CONTENTS: Introduction; Starch and its products; Starch; Dextrin; Glucose; Maltose; Sugar; Cane sugar; Beet sugar; Sugar refining; Minor sources of sugar; Caramel; Alcoholic fermentation; Beer; Malt; Mashing, boiling and hopping; Fermentation; Wine; Grapes and the vine; Fermentation; Tartar; Distillation; Grain spirit; Potable spirit; Industrial alcohol; Synthetic alcohol; Vinegar; Preparation of the wort; Acetification; Acetic acid, Acetone and glycerine.

**RIES, H.** Clays: Their Occurrence, Properties, and Uses. With especial reference to those of the United States. By Professor Heinrich Ries, Ph.D. Second edition, revised. 554 p. 8 vo. il. 1914. \$5.00

Describes the occurrence, properties, methods of mining and manufacturing, and uses of a vast variety of clays.

CONTENTS: Origin of clay. Chemical properties of clay. Physical properties of clay. Kinds of clays. Methods of mining and manufacture. Distribution of clay in the United States. Alabama. Louisiana. Maine. North Carolina. North Dakota to Wyoming. Fuller's Earth.

**RIES, H.** Technology of the Clay Industry. (U. S. Geological Survey.) 1895. \$1.50  
Contains a compilation of analyses of clays in the United States.

**RIES, H.** Economic Geology of the United States. 856 p. 8 vo. il. 1916. \$5.00

CONTENTS: Coal. Petroleum. Natural gas and other hydrocarbons. Building stones and clays. Cements. Salines and associated substances. Gypsum. Fertilizers. Abrasives. Minor minerals. Underground waters. Ore deposits. Iron. Copper. Lead. Zinc. Silver. Gold. Minor metals.

**RIES, H., and WATSON, T. L.** Engineering Geology. 722 p. 8 vo. il. 1915. \$5.00

CONTENTS: The rock forming minerals. Character, mode of occurrence, and origin of rocks. Weathering and soils. Surface waters. Underground waters. Landslides. Wave action and shore currents. Lakes: Their origin and relation to engineering work. Glacial deposits. Building stone. Limes, cement and plaster. Clay and clay products. Coal series. Petroleum, natural gas and hydrocarbons. Road foundations and road materials. Ore deposits. Historical geology.

**ROBERTS-AUSTEN, W. C.** An Introduction to the Study of Metallurgy. Revised and enlarged by F. W. Harbord. A.R.S.M. Sixth edition, revised. 478 p. 8 vo. il. 1910. \$6.50

In most English works on Metallurgy, the most important metals are dealt with separately and in detail. In this volume the subject is treated as a whole, choosing typical appliances and indicating their use in connection with groups of metals.

In this new revised edition of Sir William Roberts-Austen's work, Professor Harbord has endeavored to preserve the general scheme of the work and to make as few alterations as possible, but the results of recent research and general metallurgical progress have made certain revisions and additions inevitable.

Among the most important changes are the revisions of the chapter on physical constants, which has been revised in accordance with the latest available data; the chapter on Pyrometry has been practically rewritten on account of the rapid progress which has been made in pyrometric work; a new chapter on Metallography has been prepared to replace Chapter XI on Microstructure in the last edition, the subject of fuel has been given a chapter to itself instead of being discussed in connection with thermal measurement, and this chapter is illustrated by types of modern cooking ovens and gas producers. In the chapters on furnaces, sketches of typical furnaces used in modern metallurgical practice have been introduced as illustrations to replace those of furnaces which are no longer in general use, and sketches of some of the principal types of electric furnaces have also been added.

CONTENTS: The relation of metallurgy to chemistry. Physical properties of metals. Alloys. The thermal treatment of metals. Pyrometry. Metallography. Fuel. Materials and products of metallurgical processes. Furnaces. The supply of air to furnaces. Thermchemistry. Typical metallurgical processes. Economic considerations.

**ROBERTSON, JOHN BRAITHWAITE.** The Chemistry of Coal. 96 p. 12 mo. 1919. \$1.25

CONTENTS: Classification and occurrence of coal; The origin of coal; The action of solvents on coal; The oxidation of coal; The destructive distillation of coal; The analysis of coal—Sampling; The analysis of coal—Proximate analysis; The analysis of coal—Ultimate analysis; The analysis of coal—Calorific value; The properties of coal on combustion; Bibliography; Index.

**ROBERTSON, T. B.** Physical Chemistry of the Proteins. By T. Brailsford Robertson, Ph.D., D.Sc., Professor of Bio-

chemistry in the University of Toronto. With very complete lists of literature cited and indexes. 498 p. 8 vo. 1918. \$5.00

Our exact knowledge of the physical chemistry of the proteins is of recent date, but a great variety of facts are scattered widely in medical, biological and chemical literature which have hitherto never been adequately correlated. In this book, while emphasis is laid primarily upon general principles, the endeavor has also been made to provide for those interested in this subject a reference book in which the widely scattered literature is collected and systematized and rendered more generally accessible to students and specialists.

**ROBINSON, CLARK S.** Solvent Recovery. To be published by The Chemical Catalog Co., Inc. Ready about September 15, 1922.

**RODENHAUSER, W., and Others.** Electric Furnaces in the Iron and Steel Industry. Third Edition. 460 p. 8 vo. il. 1920. \$4.50

**CONTENTS:** PART I.—ELECTRIC FURNACES; THEIR THEORY, CONSTRUCTION AND OPERATION. Fundamental laws and principles. Effects of the electric current. Power factor and alternating current theory. General conditions for the operation of electric furnaces. The arc furnace in general. Types of arc furnaces. The induction furnace in general. Types of induction furnaces. PART II. A. Materials for furnace construction and the costs of operation. B. The electro-metallurgy of iron and steel. Electric smelting of iron ores. Use of the electric furnace for smelting and refining.

**ROGERS, ALLEN (Editor).** Industrial Chemistry. A manual for the student and manufacturer. Written by a staff of forty-two eminent specialists. Third edition, thoroughly revised and enlarged. 1255 p. 8 vo. il. 1920. \$7.50

**CONTENTS:** General Processes by Allen Rogers. Water for Industrial Purposes by H. Stabler and A. A. Chambers. Fuels by J. C. W. Frazer. Sulphuric Acid by W. M. Grosvenor. Nitric Acid by W. M. Grosvenor. Salt and Hydrochloric Acid by O. L. Shinn. Elements and Compounds by Allen Rogers. Chlorine and Allied Products by W. F. Dörflinger. Electrochemical Industries by W. L. Landis. Lime, Cement and Plaster by Richard K. Meade. Clay, Bricks and Pottery by Allen Rogers. Glass by James Gillinder. White Lead by G. W. Thompson. Zinc Oxide by George B. Heckel. Pigments and Paint Oils by Maximilian Toch. Mixed Paints by Henry A. Gardner. The Metallurgy of Iron and Steel by Bradley Stoughton. Fertilizers by A. G. Stillwell. Commercial Organic Chemicals by Allen Rogers. Illuminating Gas by W. H. Fulweiler. Coal Tar and its Distillation Products by F. E. Dodge. The Petroleum Industry by Thomas T. Gray. The Destructive Distillation of Wood by W. B. Harper. Oils, Fats and Waxes by Carleton Ellis. Lardered Oil by G. W. Thompson. Hydrogenation of Oils by Carleton Ellis. Lubricating Oils by Augustus H. Gill. Soaps and Soap Powder by Lincoln Burrows. Glycerine by A. C. Langmuir. Laundering by W. F. Paragher. Essential Oils, Synthetic Perfumes and Flavoring Materials by Alois von Isakovich. Turpentine and Rosin by Charles H. Herby. Resins, Oleo-Resins, Gum Resins and Gums by Allen Rogers. Shellac by A. C. Langmuir. Rubber and Allied Gums by Frederic Danneneth. Varnish by A. H. Sabu. Sugar by Guilford L. Spencer. Starch, Glucose, Dextrin and Gluten by G. W. Rolfe. Brewing and Malting by Robert Wahl. Wine Making by L. W. Haas. Distilled Liquors by Gustave L. Gook. Textiles by J. Merritt Matthews. Dyestuffs and their Application by L. A. Olney. The Art of Paper Making by G. F. Lull. Cellulose Industries by Jasper E. Crane. Explosives by O. W. Wilcox. Leather by Allen Rogers. Glue and Gelatine by Jerome Alexander. Casein by F. L. Tague. Practical Applications of Colloid Chemical Principles by Jerome Alexander. Dehydrated, Dried and Evaporated Foods, Condensed Foods by Clarence V. Ekroth. Baking by Arnold Wahl.

Aims to furnish a complete text on industrial chemistry that shall be recognized as a standard of modern methods and processes. The subject matter is essentially descriptive without omitting the necessary theoretical considerations, and each chapter follows as far as possible this general plan. The raw material, the treatment of raw material preparatory to manufacture and manufacturing processes, its chemical theory and reactions involved. The illustrations are numerous and wherever possible reference are cited.

**ROGERS, ALLEN.** Laboratory Guide of Industrial Chemistry. Second edition, entirely rewritten and enlarged. 219 p. 8 vo. il. 1917. \$2.00

**CONTENTS:** General Process; Inorganic Preparations; Organic Preparations; Dyeing of Textile Fibers, Pigments and Lakes; Driers, Varnishes, Paints and Stains; Soap and Allied Products; Leather Manufacture; Wood Fiber, Pulp and Paper; Useful Data.

The object of this elementary laboratory guide is to acquaint students of chemistry with actual commercial problems by bringing to their experience practical methods of handling materials on a large scale; the care and use of machinery; the cost of raw materials; transportation, wage system, handling of men and shop discipline. The processes described for application on a small scale are adaptable to the larger commercial bases, and in many instances the methods are those commonly used at present, and actual factory practice is carried out.

**ROHLAND, P.** Colloidal and Crystalloidal State of Matter. 54 p. 12 mo. 1912. \$1.25

**ROLFE, G. W.** The Polariscopes in the Chemical Laboratory. An introduction to Polarimetry and Related Methods. By George William Rolfe, A. M., Instructor in Sugar Analysis in the Massachusetts Institute of Technology. 320 p. 12 mo. 1905. \$2.25

In this book the entire matter of sugar analysis is taken up; also the various processes of sugar manufacture and sugar refining. It explains in an elementary way the fundamental principles and their application in general laboratory practice.

**ROLPH, GEORGE N.** Something About Sugar; its history, growth, manufacture and distribution. 341 p. 8 vo. il. 1917. \$4.00

It gives a history of the commodity and its production in different parts of the world, and seeks to show the various steps by which sugar from cane or beets is prepared for the consumer.

**ROSCOE, H. E., and SCHORLEMMER, C.** A Treatise on Chemistry. In two volumes. 8 vo. Vol. I. The Non-Metallic Elements. Fifth edition, completely revised with the assistance of Dr. J. C. Cain. 967 p. 1920. \$9.00

**CONTENTS:** Historical introduction; General principles of the sciences; Physical determination of the atomic weight of monatomic gases; Chemical nomenclature; The non-metallic elements; Comparison of metrical with English measures.

Vol. II. The Metals. Fifth edition, completely revised. 1483 p. 1913. \$12.00

**CONTENTS:** The metals; Determination of atomic weights of metals, valency of the elements, Crystalline form and colloidal solutions of metals, Alloys and amalgams, Constitution of salts, acids and bases; Solubility, fusibility and volatility of salts; Genic properties of salts, Chemical change and the law of mass action; Spectrum analysis; Crystallography; Systematic description of the metals and their derivatives by groups, The radioactive elements.

**ROSE, T. KIRKE, D.Sc.** The Metallurgy of Gold. Sixth edition. 601 p. 8 vo. il. 1915. \$7.50

The author gives in condensed form such information concerning the new methods and machinery used in the treatment of gold ores which could be gleaned out of the large stock of literature and experience of recent years. Mr. Rose has had considerable practical experience in extracting gold and silver in the Western States of America.

**CONTENTS:** The physical and chemical properties of gold. Alloys of gold. Chemistry of the compounds of gold. Mode of occurrence and distribution of gold. Treatment of shallow placer deposits. Deep placer deposits. Ore crushing in the stamp battery. Amalgamation in the stamp battery. Other forms of crushing and amalgamating machinery. Fine grinding. Concentration in gold mills. Dry crushing. Roasting. Chlorination. The cyanide process—chemical reactions. The cyanide process—general methods. The cyanide process—special methods and examples of practice. The refining and parting of the gold bullion. The assay of gold ores. The assay of gold bullion. Statistics of gold production and consumption. Bibliography. Index.

**ROSENHAIN, WALTER.** An Introduction to the Study of Physical Metallurgy. 375 p. 8 vo. il. 1915. \$4.00

**CONTENTS:** Introductory. Structure and constitution of metals and alloys. Microscopic examination of metals. The metallurgical microscope. The microstructure of pure metals and of alloys. Thermal study of alloys; The Constitutional diagram and the physical properties of alloys; Typical alloy systems. The iron-carbon system. The properties of metals as related to their structure and constitution. Mechanical testing of metals. Effect of strain on the structure of metals; Thermal treatment of metals; Mechanical treatment of metals, including casting, Defects and failures in metals and alloys.

**ROSENHAIN, WALTER.** Glass Manufacture. 264 p. 8 vo. Second edition, largely rewritten. 1919. \$4.00

**CONTENTS:** Physical and Chemical Properties; The Raw Materials of Glass Manufacture; Crucibles; Furnaces for the Fusion of Glass; Process of Fusion, Processes Used in the Working of Glass, Bottle Glass; Blown and Pressed, Rolled or Plate; Sheet and Crown; Colored; Optical, Miscellaneous Products. Appendix.

**ROTHERY, G. C., and EDMONDS, H. O.** The Modern Laundry; including dry cleaning and dyeing. 2 vols. 348, 314 p. 8 vo. 1911. \$15.00

**ROTHWELL, C. F. SEYMOUR.** The Printing of Textile Fabrics. 312 p. 8 vo. il. 1897. \$6.00

**CONTENTS:** Introduction. PART I—The machinery used in textile printing. PART II—Thickeners and mordants. PART III—The printing of cotton goods. The bleaching of cotton piece goods for printing. The steam style. Colors produced directly on the fibre. Dyed styles. Padding style. Resist and discharge styles. The printing of compound colorings, etc. PART IV—The printing of woolen goods. PART V—The printing of silk goods. PART VI—Practical recipes for printing. Appendix. Useful tables. Index. Patterns.

**ROWLAND, ARTHUR J.** Applied Electricity for Practical Men. 375 p. 8 vo. il. 1916. \$2.50

This work, aiming to avoid more than the simplest mathematics and all unnecessary theory, as well as problems of apparatus design, is written from the standpoint of the man "who puts up and operates electric circuits and apparatus." Clearly illustrated and has helpful problems and questions at the chapter endings.

**ROYLE, H. M.** Chemistry of Gas Manufacture. 316 p. 8 vo. il. 1914. \$4.50

This book covers questions and points likely to arise in the ordinary course of the duties of the engineer or manager of a gas works not large enough to necessitate the employment of a separate chemical staff. It treats of the testing of the raw materials employed in the manufacture of illuminating coal gas, and of the gas produced. The preparation of standard solutions is given, as well as the chemical and physical examination of gas coal.

**RUSHMORE, D. B., and LOF, ERIC A.** Hydro-electric Power Stations. 822 p. 8 vo. il. 1917. \$6.00

Three quarters of this work of over 800 pages is devoted to the problems of electrical and hydraulic engineering; the rest, to the economical aspects, covering the compilation of reports; load factor, water, storage, auxiliary stations, investigation of an enterprise, and cost of plants; as well as a chapter on organization and operation. In the appendices a reference to periodical articles describing the principal American plants; principal data on transmission systems operating at 40,000 volts or over; and a standard testing code for hydraulic turbines.

**RUSSELL, W. M.** Operation of Gasworks. 209 p. 8 vo. il. 1917. \$2.50

An effort to present in a concise and practical manner information on gas works management and operation according to American practice in small or medium-sized gas works. Does not profess to cover the whole field. Addressed to the foreman, superintendent, engineer, and cadet.

Contains chapters on organization and management, chemical control, coal gas, water gas, general plant operation, calorimetry and photometry.

Author is manager, Emporia Gas Company.

**SABIN, ALVAH HORTON.** Red Lead, and How to Use it in Paint. Third edition, rewritten and enlarged. 139 p. 8 vo. il. 1920. \$2.00

The essential facts about red-lead paint are presented in a clear and easily readable manner, backed up by the author's thirty years' experience and study of paints of all kinds. Compared with the second edition, which was issued early in 1919, this new printing has been rewritten and amplified to an extent so considerable as to make it almost a new book.

**CONTENTS:** How litharge is made; How red lead is made, Orange mineral; Objections to red-lead; What high-grade red lead is, Relation of lead pigments to oil; Difficulty in removing oil from lead pastes, Fineness is a merit; Litharge in red-lead; How to use litharge, Lamp-black in red-lead; Some things are not known, Turpentine, What are natural paint requirements? Elastic undercoat cracks, How much pigment is needed; How many coats? The finishing coat, Mixed pigments, Good + worse is not better, Volume proportions, Simplicity and complexity, Theory of inhibition, The Havre de Grace bridge, High-grade red-lead has long been known; Heavy paint, Water tanks and pipes, Boiled oil, Elevated water tanks, Ship painting, Railway cars and other vehicles, How to test a red-lead paint, Advantages of paste red-lead, Sanitation, Need of cleaning; Sand blast, Pickling, Scraping and wire-brushing, Mill scale; Rust is persistent and obstinate, Brushes, Paint calculations, Volume proportions; A sample problem, Thoroughness; Specifications, Stripping coat, Quality of materials, Drier and turpentine, Notes on the foregoing specifications, Quantity, oil, area covered, spreading capacity, as a paint for wood, Appendix I. Analytical methods, Determination of  $PbO_2$  (National Lead Company Laboratory), Appendix II: Specifications for painting bridges, Three coats on new bridges, Two coats on new bridges; Repainting bridges, Exterior ship painting; Interior ship painting; Specification for painting water tanks; Painting gas-holders; Architects' painting specifications for all iron, steel and other metal work. Notes.

**SABIN, ALVAH H.** The Industrial and Artistic Technology of Paint and Varnish. Second edition, revised. 473 p. 8 vo. il. 1917. \$4.00

**CONTENTS:** Early history; Varnish, Origin of the name; Linseed oil; Linoleum, Manufacture of varnish, Tung-oil, Japan and driers; Rosin; Spirit varnishes; Pyroxylin varnishes, Oil paints and paints in Japan; Varnish or enamel paints; Chinese and Japanese lacquers, Protection of metals against corrosion; Water pipe coating; Ship-bottom paints; Ship and boat painting; Carriage painting, House painting; Furniture varnishing.

**SABIN, ALVAH H.** White Lead: Its Use in Paint. 133 p. 12 mo. 1920. \$1.25

**SADTLER, SAMUEL SCHMUCKER.** Chemistry of Familiar Things. Second edition, revised. 320 p. 8 vo. il. 1916. \$2.50

A layman's chemistry but yet of great value to the instructor who carries a short course in the high school. The author clearly presents information concerning the outstanding materials of daily life in such a way that the novice is stimulated to a further study of the science. No child's book by any means, but a thoroughly interesting treatment of the intelligent adult.

**CONTENTS:** Introduction, Brief chemical outline, Historical development of chemistry, The periodic system of elements, The chemistry and production of light, heat, combustion, and insulation, Air, oxidation, and ventilation, Water, Alkalies and salts, Metals, Gold and silver, Chemistry of the earth's evolution, Soil and its conservation, Food elements and food classes, Individual foods, Animal feeding, Fermentation, Chemistry of the body, Soaps, solvents, and paints, Paper and textiles, Leather and rubber, Silicious substances and glass, A few important definitions, Index.

**SADTLER, SAMUEL P.** Industrial Organic Chemistry. Fourth edition. Adapted for the use of manufacturers, chemists, and all interested in the utilization of organic materials in the industrial arts. 601 p. 8 vo. il. 1912. \$6.00

**CONTENTS:** Petroleum and mineral oil industry, Industry of the fats and fatty oils, Industry of the essential oils and resins, The cane-sugar industry, The industries of starch and its alteration products, Fermentation industries—Malt liquors, wine, ardent spirits, bread, vinegar, Milk industries, Vegetable textile fibres—Paper-making, gun-cotton, etc., Textile fibres of animal origin, Wool, silk, artificial silk, Animal tissues and their products—Leather, glue, etc., Industries based upon destructive distillation—Wood and coal, The artificial coloring matters, Natural dye colors, Bleaching, dyeing and textile printing, Appendix—The metric system, Tables for determination of temperatures, Specific gravity tables, Alcohol tables, Physical and chemical constants of fixed oils and fats.

**SADTLER, SAMUEL P., and COBLENTZ, VIRGIL.** Pharmaceutical and Medical Chemistry. Fourth edition revised. Intended for the use of Pharmaceutical and medical students. Being the fourth edition of Sadtler and Coblenz's Chemistry, revised and rewritten. Based on the Fifth Decennial Revision of the United States Pharmacopœia. 749 p. 8 vo. il. 1913. \$5.50

**CONTENTS:** PART I.—Elementary physics.—Matter, force, and motion. Special properties of matter. Acoustics, Radiant energy: Heat, light, Magnetism, Electricity, Magneto-electric and dynamo electric generators, Thermo-electric currents.

**PART II.**—Chemistry of the non-metals.—Theoretical introduction. Hydrogen, The halogens, The oxygen group, The nitrogen group, Boron, The carbon group, Classification of the elements.

**PART III.**—Chemistry of the metals.—The alkali metals, The alkaline earth group, The magnesium group, The silver group, The copper and mercury group, Aluminum and the rare earths, The tin group, The bismuth group, The chromium group, The iron group, The platinum group.

**PART IV.**—Organic chemistry.—Introductory, Open-chain or aliphatic hydrocarbons, Derivatives of the open-chain hydrocarbons, Closed-chain groups with less than six atoms of carbon, Closed-chain or aromatic compounds, Isocyclic compounds containing one nucleus, Aromatic compounds with more than one nucleus, The alkaloids and ptomaines, The terpenes and their derivatives, Glucosides: Bitter and neutral principles, Tissue-forming substances or proteid matter, Electrolysis and its applications, Appendix, Index.

**SAKLATWALLA, B. D.** Aluminothermic Reduction of Metals. American Chemical Society Monograph. Ready about July 1, 1922.

**SANDEMAN, E. A.** Earthenware. Notes on the manufacture of earthenware. 375 p. 12 mo. 1917. \$3.50

**SAUVEUR, ALBERT.** Metallography and Heat Treatment of Iron and Steel. 486 p. 8 vo. il. 1918. \$7.00

**SAVAGE, W. G.** The Bacteriological Examination of Food and Water. By W. G. Savage, R.Sc., M.D., D.P.H., County Medical Officer of Health, Somerset. Second edition. 200 p. 12 mo. il. 1917. \$2.50

**SCARD, FREDERICK J.** The Cane Sugar Factory. 128 p. 12 mo. 1913. \$0.75

**SCHENCK, RUDOLPH and DEAN, R.S.** Physical Chemistry of the Metals. 230 p. 8 vo. il. 1919. \$3.00

The book is based on a series of lectures designed to show the application of physical chemistry to the study of smelting and metalurgical processes. The translator has revised the numerical data to agree with the accepted values.

**CONTENTS:** Introduction, properties of metals, Metallic solutions and alloys, Alloys of metals with carbides, oxides, and sulphides, iron and steel, matrix, phase rule, The metallurgical reactions, oxidation and reduction, Decomposition of carbon monoxide, blast furnace process, The reaction of sulphides.

**SCHERER, R.** Casein. Its Preparation and Technical Utilization. Translated from the German by Charles Salter. Second edition, revised and enlarged. 106 p. 8 vo. il. 1911. \$3.50

**CONTENTS:** Casein, Its origin, preparation and properties, Various methods of preparing, Its composition, Casein plants, Technica of casein painting, Adhesives and putties, Preparation of plastic masses from casein, Uses of casein in the textile industry, for finishing, color printing, etc., Casein foodstuffs, Sundry applications; Compounds, Recent patents granted for the improved manufacture and utilization of casein.

**SCHIMPF, H. W.** Manual of Volumetric Analysis. By Professor Henry W. Schimpf, Ph.D., M. D. Fifth edition. 745 p. 8 vo. il. 1917. \$4.50

Outlines chiefly pharmaceutical and food analysis. The volumetric processes described are those that have been tried and found of value.

**SCHIDROWITZ, P.** Rubber. Its Production and Industrial Uses. 320 p. 8 vo. il. 1911. \$6.00

**CONTENTS:** Historical, Production and consumption of rubber, General nature of the rubber industry, Wild rubber, Plantation industry, Plantation system of the preparation of rubbers other than hevea, Industrial rubbers, Rubber latices and coagulation, Crude rubbers compared, Tackiness, Chemistry of crude rubber, Theory of vulcanization, Manufacture of rubber goods, Substitutes and waste rubber disposal, Chemical, physical and mechanical properties of vulcanized rubber, Chemical analysis and physical examination of rubber, Mechanical tests, Contracts and specifications.

**SCHMIDT, WALTER KARL.** Problems of the Finishing Room. 138 p. 8 vo. 1916. \$5.00

A practical book covering a wide range of details for the production and application of stains, fillers, shellacs, varnishes, and waxes. Gives attention to fast to light anilines, and strives to develop "a better understanding of the artisan in the production of chemical solutions which make use of the natural coloring constituents ever present in wood." There are helpful suggestions for the construction of the finishing room, the equipment of the laboratory, the preparation of the wood, and the making of the finishing box. Many formulae are included.

**SCHIMPF, HENRY W.** Essentials of Volumetric Analysis. Third edition. 366 p. 8 vo. 1911. \$2.50

A practical guide for the work in the laboratory and an introduction to more advanced studies. Subject matter is grouped under the headings of Neutralization, Precipitation, Oxidation, Iodometry.

**CONTENTS:** General principles of chemical combination; Volumetric or standard solutions; Indicators, Apparatus, Calculating results; Analysis by neutralization, precipitation, oxidation and reduction; Estimation of alkaloids; Assaying of vegetable drugs, Estimations involving use of decinormal bromine V. S.; Technical methods for fats, oils and waxes, Sugars, Formaldehyde; Alcohol, Nitrites, Hydrogen dioxide; Soluble carbonates, Urea.

**SCHIMPF, HENRY W.** A Systematic Course of Qualitative Chemical Analysis of Inorganic and Organic Substances. Third edition, revised. 187 p. 8 vo. 1917. \$1.75

Contains most of the inorganic as well as organic qualitative reactions that a student of pharmacy is required to know.

**CONTENTS:** Definitions and general considerations; Identification and separation of inorganic bases and acids, Metals; Alloys and hard metals, Table of solubilities, Acids, Qualitative analysis of organic substances; Behavior of organic substances with immiscible solvents; With Fehling's solution; Detection of the more common organic compounds; Detection of poisons; Preparation of reagents.

**SCHOELLER, W. R., and POWELL, A. R.** The Analysis of Minerals and Ores of the Rare Earths. 239 p. 8 vo. 1920. \$5.00

**SCHON, H. A. v.** Hydroelectric Practice. Second edition. 410 p. 8 vo. il. \$6.00

**CONTENTS:** Part I.—Analysis of a hydro electric project, The market, Power opportunity, Feasibility and practicability, Cost of development, Value of project and presentation, Part II.—Designing and constructing the development—The survey, Development program, Structural types, Equipment, Constructing the plant, Part III.—Operating and maintaining the plant.—The works, The equipment, Tables, General index.

**SCHULTZ, GUSTAV, and JULIUS, P.** Farbstoff-Tabellen. 1914. (Facsimile reprint.) 432 p. 8 vo. \$10.00

**SCHULTZ, G., and JULIUS, P.** A Systematic Survey of the Organic Coloring Matters. Founded on the German of Drs. G. Schultz and P. Julius. Revised throughout and greatly enlarged by Arthur G. Green, F.I.C., F.C.S. 290 p. 8 vo. 1908. \$9.00

**SCHUSTER, A., and SHIPLEY, A. E. Britain's Heritage of Science.**

334 p. il. 8 vo. 2nd edition, 1917. \$5.00

CONTENTS: The ten landmarks of physical science; Physical science—the heritage of the universities during the seventeenth and eighteenth centuries; Physical science—the non-academic heritage during the seventeenth and eighteenth centuries; Physical science—the heritage of the nineteenth century; Physical science—some industrial applications; Physical science—scientific institutions; Biological science in the middle ages; Botany; Zoology; Physiology; Geology; Index.

**SCHWEIZER, V. Distillation of Resins, Resinate Lakes and Pigments.**

Carbon pigments and pigments for typewriting machines, manifolders, etc. 191 p. 8 vo. 1905. \$3.00

CONTENTS: Resins and Their Employment for Production of Chemical Products; Rosin, Hard Resins, Distillation of Hard Resins, Manufacture of Illuminating Gas from Rosin, Dry Distillation of Rosin, Rosin Oils, Nature of Crude Products, Rectification of Rosin Oil; Manufacture of Patent Lubricants, Rosin Soaps or Resinates, Manufacture of Resinate Varnishes, Oil Lampblack and Lampblack Pigments; Lampblack Chambers, Of Printing Inks, Other Lampblack Inks, Inks for Typewriting Machines.

**SCOTT, WILFRED W. (Editor). Standard Methods of Chemical Analysis.**

A manual of analytical methods and general reference for the analytical chemist and for the advanced student. Second edition, revised. 929 p. 8 vo. il. 1917. \$7.50

(The following specialists have written chapters for this book: H. A. Baker, L. C. Barton, F. G. Breyer, B. S. Clark, Wallace G. Derby, Wm. F. Dorrillinger, D. K. French, H. A. Gardner, A. H. Gill, F. E. Hale, R. F. Hickman, W. B. Hicks, R. K. Meade, J. C. Olsen, R. S. Owens, W. L. Savill, J. A. Schaefer and W. W. Scott.)  
CONTENTS: Aluminum, Antimony, Arsenic, Barium, Bismuth, Boron, Bromine, Cadmium, Calcium, Carbon, Cerium and other rare earths; Chlorine; Chromium; Cobalt; Copper; Fluorine; Glucinum (Beryllium); Gold; Iodine; Iron; Lead; Magnesium, Manganese, Mercury; Molybdenum, Nickel; Nitrogen; Phosphorus; Platinum; Rarer elements of the allied platinum metals; Potassium; Sodium and other alkalis; Selenium and tellurium; Silicon; Silver; Strontium; Sulphur; Thorium, Tin, Titanium; Tungsten, Tantalum and Columbium, Uranium; Vanadium; Zinc; Zirconium; Acids; Water analysis; Oils, fats and waxes; Paints; Cement, Special alloys; Coal; Gas; Assaying of gold, silver, etc.; Useful data; Conversion tables; Table of melting points; Acid tables; Books of reference.

**SCUDDER, HEYWARD. Electrical Conductivity and Ionization Constants of Organic Compounds.**

575 p. 8 vo. 1914. \$3.00

Presents a bibliography of all the measurements of the ionization constants and the electrical conductivity of organic compounds that have appeared in the periodical literature between 1889 and 1910, inclusive, together with the values of the ionization constants and certain values of the electrical conductivity measurements, including also qualitative work. The work is divided into a set of tables arranged according to the names of compounds, containing all the data that may be given, with a bibliography of all of the references to each compound; a formula index to the compounds; a bibliography arranged according to names of authors; a subject index to certain subjects, and a journal list giving the names of all journals examined with the number and date of the last volume examined.

**SEARLE, ALFRED B. An Introduction to British Clays, Shales, and Sands.**

451 p. 12 mo. il. 1912. \$2.50

CONTENTS: Igneous rocks from which clays are derived. Formation of clays, etc., from igneous rocks. The sedimentary rocks. The clay forming portions of sedimentary rock. How recent clay beds were formed. The chief characteristics of various clays and shales. Materials similar to clay. Mineral and other constituents of clays. The physical and chemical properties of clays. Prospecting, mining, and quarrying. The purification and preparation of clays. The legal position of clays. Appendix. Index.

**SEARLE, A. B. Cement, Concrete and Bricks.**

415 p. 8 vo. 1911. \$3.00

CONTENTS: The raw materials for cements; Methods of cement manufacture; Chemical and physical changes in cements; Changes that occur in setting and hardening; Testing the properties of cements; The components of concrete and their properties; Preparation of concrete; Reinforced concrete, Special properties of concrete, Testing concrete; Raw materials for bricks; Methods of brickmaking; The chemical and other changes in drying and burning bricks; Basic and neutral bricks.

**SEARLE, ALFRED B. Clays and Clay Products.** (Pitman's Common Commodities and Industries.)

163 p. il. 1920. \$1.00

CONTENTS: Formation of clays. Varieties of clays; The winning of clays; Prospecting and boring; Mining and quarrying; Preparing the clay. Weathering. Purifying clays. Crushing and grinding. Tempering and pugging; Clay slips and their uses. Bricks, Tiles, Terra cotta; Coarse pottery and sanitary ware. Stoneware and drainpipes; Fine earthenware, Porcelain (including chinaware and chemical ware); Refractory materials (including refractories, firebrick, furnace linings and crucibles and glass pots); Portland cement. Ultramarine and other chemicals.

**SEARLE, A. B. Kilns and Kiln Building.**

504 p. 8 vo. 1915. \$2.00

**SEARLE, ALFRED B. Modern Brickmaking.**

Second edition, revised and enlarged. 510 p. 310 il. 8 vo. 1920. \$7.00

CONTENTS: The nature and selection of clays; Their special suitability for certain purposes; The colors and characteristics of various bricks, Sand, breccia and other materials used; The general manufacture of bricks; Hand brickmaking processes; Plastic moulding by machinery; Wire-cut bricks; Mixers and feeders; Expression rolls; Pug mills, mouthpiece presses and auger machines; Cutting tables; Re presses; Dryers; The stiff plastic process; The semidry or semiplastic process; The dry or dust process; Kiln-setting and burning; Vitrified brick for special work; Fire-bricks and blocks; Glazed bricks; Perforated, radial, and hollow bricks and blocks; Fire-proof flooring; Moulded and ornamental bricks; Drying raw clay; Sources of difficulty and loss.

A complete treatise on the whole industry, in which is condensed into convenient limits the results of a wide practical experience with all the better known processes, machines and kilns now in use.

**SEARLE, ALFRED B. Refractory Materials: Their Manufacture and Uses.**

444 p. 8 vo. il. 1917. \$6.00

"The purpose . . . is to summarize, in convenient form, the chief materials and products used in the construction of furnaces, etc., and to describe the manufacture and properties of firebricks, retort crucibles, etc., used in the metallurgical, engineering, chemical and other industries. No other book published in this country [England] is devoted solely to this important subject. It is intended to supply the user of refractory materials with the main properties of the materials and products available to him, whilst the manufacturer will also find detailed descriptions of the raw materials, the methods of preparation, manufacture and use. The appendix contains specifications used by various authorities and sundry tables relating to temperature."—Preface.

**SEARLE, ALFRED B. The Clayworker's Handbook.**

Third edition, revised and rewritten. A manual for all engaged in the manufacture of articles from clay. 416 p. 12 mo. il. 1919. \$6.50

CONTENTS: The materials used in clayworking. Preparation of the clay. Machinery transport; Conveyors, pumps and fans. Drying and dryers. Engobing and glazing. Setting or charging kilns. Firing. Discharging. Sorting, packing and despatching. Defects. Waste. Tests, analysis, and control. Useful tables. Index.

**SEELIGMANN, T., TORRILHON, G. L., and FALCONNET, H. India Rubber and Gutta-percha.**

Translated by J. G. McIntosh. A complete practical treatise on india rubber and gutta percha in their historical, botanical, arboricultural, mechanical, chemical and electrical aspects. Second English edition, revised and enlarged. 424 p. 8 vo. il. 1910. \$6.00

CONTENTS: INDIA RUBBER. Botanical Origin. Climatology. Soil. Rational Culture and Acclimation of the Different Species of India rubber Plants. Methods of Obtaining the Latex. Methods of Preparing Raw and Crude India rubber. Classification of the Commercial Species of Raw Rubber. Physical and Chemical Properties of the Latex and of India rubber. Mechanical Transformation of Natural Caoutchouc into Washed or Normal Caoutchouc (Purification) and Normal Rubber into Masticated Rubber. Softening, Cutting, Washing, Drying. Preliminary Observations. Vulcanization of Normal Rubber. Chemical and Physical Properties of Vulcanized Rubber. General Considerations. Hardened Rubber or Ebonite. Considerations on Mineralization and other Mixtures. Coloration and Dyeing. Analysis of Natural or Normal Rubber, and Vulcanized Rubber. Rubber Substitutes. Imitation Rubber. GUTTA-PERCHA. Botanical origin. Climatology. Soil. Rational Culture. Methods of Collection. Classification of the Different Species of Commercial Gutta percha. Physical and Chemical Properties. Mechanical Transformation. Methods of Analyzing Gutta-percha Substitutes.

**SEGERBLOM, WILHELM. Tables of Properties of Over Fifteen Hundred Common Inorganic Substances.**

Second edition revised. 144 p. 8 vo. 1916. \$3.00

CONTENTS: Sodium; Potassium; Lithium. Ammonium; Barium; Strontium; Calcium; Magnesium, Aluminum, Chromium; Iron; Cobalt; Nickel; Manganese; Zinc; Silver; Lead; Mercury; Copper; Cadmium, Bismuth, Arsenic; Antimony; Tin.

**SEIDELL, ATHERTON. Solubilities of Inorganic and Organic Substances.**

Second edition, revised and enlarged. 843 p. 8 vo. 1919. \$7.50

Compiled from data in the periodical literature. Author is Chemist in the Public Health and Marine Hospital Service.

**SELLEW, WILLIAM H. Steel Rails, Their History, Properties, Strength and Manufacture.**

With notes on the principles of rolling stock and track design. 575 p. 4 to. il. 1913. \$10.00

(Author is principal assistant engineer, Michigan Central Railroad.)

CONTENTS: Development of the Present Section. Early Sections. Present Sections. Pressure of the Wheel on the Rail. Speeds of Modern Locomotives. Effect of Modern Locomotives. Excess Balance and Angularity of the Main Rod. Effect of Irregularities in the Track. Effect of Rocking of the Engine. Effect of Flat Spots in the Wheels. Impact Tests. The Dynamic Augment of the Wheel Load. Electric Locomotives. Cars. Supports of the Rail. The Tie. Bearing of the Rail on the Tie. Fastening of the Rail to the Tie. Strength of the Tie Bearing on the Ballast. Bearing on the Subgrade. Supporting Power of the Tie. Stresses in the Rail. Stresses at Point of Contact of the Wheel with the Rail. Proposed Solutions of the Bending Stress in the Rail. Tests to Determine the Bending Stress in the Rail. Calculation of the Bending and Shearing Stress in the Rail. Effect of the Joint. Strength of the Rail. Influence of Stress and Strain on the Strength of the Rail. Effect of Low Temperature on the Strength of the Rail. Physical Tests of the Strength of the Rail. The Strength of the Rail and Proper Weights for Various Conditions of Loading. Influence of Detail of Manufacture. Chemical Composition. Extraction of the Iron from its Ore. Conversion of the Steel. Casting the Ingot. Influence of Mechanical Work. Rail Specifications. Comparison of American Specifications. Specifications of the New York Central Lines. Specifications for Rails Rolled for Export. British Standard Specifications of Bull-Headed Railway Rails. British Standard Specifications of Flat Bottom Railway Rails. Specifications for Street Railway Rails. Bibliography of Rail Specifications. Appendix. Reports and Records.

**SERGEANT, E. W. Centrifugal Pumps and Suction Dredgers.**

188 p. 8 vo. il. 1916. \$4.50

The advance in the design, construction and applications of all classes of centrifugal pumping machinery necessitates a complete book on the subject. This presents the modern information desired by draftsmen, designers and engineers responsible for the manufacture, irrigation. Centrifugal sewage pumping machinery. Centrifugal pump.

CONTENTS: Historical. Fundamental principles underlying the action of centrifugal pumps. Principles of design. The disc. Forms of pump casings. Pattern-making. Moulding machining. Description of various types of pump casings shown in figures. Pumps in series. Parallel centrifugal pumps. Pumps of high capacity on low heads. Charging apparatus. Testing of centrifugal pumps. Piping arrangements and valves. Centrifugal pumping machinery for drainage and irrigation. Centrifugal sewage pumping machinery. Centrifugal pumping machinery for docks. Centrifugal pumps for salvage of wrecks. Centrifugal fire pumps. Centrifugal pumps driven by steam turbines. Rotary air pumps. Pumps for dredging and conveying solids. Cutter gear. Dredgers of simple design. Transporter dredgers. Appendix: Dimensions, horse-powers, discharges. Cost. Prices, etc. Index.



**SEXTON, A. H., and PRIMROSE, J. S. G.** Outline of the Metallurgy of Iron and Steel. Second edition. 572 p. 8 vo. il. 1912. \$6.50

**SHYMOUR, ALFRED.** Modern Printing Inks. A practical handbook for printing ink manufacturers and printers. 90 p. 8 vo. il. 1910. \$3.00

CONTENTS: Linseed oil; Varnish; Dry colors; Blacks, whites, yellows, reds, browns, blues, greens, lakes. The grinding of printing inks; Inks and color mixing; The characteristics of some printing processes; Driers; Bronze powders and bronzing; Things worth knowing

**SHERMAN, H. C.** Chemistry of Food and Nutrition. By Henry C. Sherman, Ph.D., Professor of Food Chemistry in Columbia University. 355 p. 8 vo. 1916. \$2.40

The purpose of this volume is to present the principles of the chemistry of food and nutrition with special reference to the food requirements of man and the considerations which should underlie our judgment of the nutritive value of food. The food is here considered chiefly in its nutritive relations.

While neither the size nor the purpose of this book would permit an historical or technically critical treatment, a limited number of historical investigations and controverted views have been mentioned in order to give an idea of the nature and validity of the evidence on which our present beliefs are based, and in some cases to put the reader on his guard against theories which, while now outgrown, are still sometimes encountered.

**SHERMAN, H. C.** Methods of Organic Analysis. By Henry C. Sherman, Ph.D., Professor of Food Chemistry in Columbia University. 407 p. 8 vo. 1917. \$3.00

A discussion of the systematic treatment of the subject of Organic Analysis with reference especially to plant and animal substances and their manufactured products. The topics selected are those which will best illustrate the fundamental principles and procedures of Organic Analysis and at the same time familiarize the student with the natural and industrial products, the analysis of which is most often required in practice. Special attention has been given to solid and liquid fuels, industrial alcohol, crude petroleum, aldehydes, sugars, proteins, and food preservatives.

**SHERMAN, H. C., and SMITH, S. L.** The Vitamins. American Chemical Society Monograph. About 500 p. il. Ready about February 1, 1922.

CONTENTS: Historical introduction; Terminology; The three vitamins: Physical and chemical properties, occurrence in foods, functions, storage in the body, general significance in nutrition; Adequacy of American food supplies

**SHREVE, R. NORRIS.** Dyes Classified by Intermediates. To be published by The Chemical Catalog Co., Inc. About 300 p. Ready, November, 1921.

CONTENTS: Intermediates; Formulas, Molecular weights, Production statistics, Dyes, Intermediates used; Classification by use, Classification by intermediates; Trade names.

**SIBLEY, R., and DELANY, C. H.** Elements of Fuel Oil and Steam Engineering. A practical treatise dealing with fuel oil for the central station man, the power plant operator, the mechanical engineer and the student. Second edition. 446 p. 8 vo. il. 1921. \$5.00

**SILVERMAN, ALEXANDER, and others.** Glass Manufacture. About 1000 p. 8 vo. il. (To be published by The Chemical Catalog Co., Inc.) In Preparation

A complete treatise on the manufacture of all kinds of glass as carried on in the United States, including the recent important advances in glass technology made under the influence of the war. Every phase of the modern glass industry is dealt with in a practical manner including complete information with regard to the raw materials of the glass industry and the construction of modern glass making machinery. The author, who is head of the Department of Chemistry at the University of Pittsburgh, has been prominently identified with the glass industry for many years, and is being assisted in the preparation of this book by several other experts, who are contributing special chapters.

CONTENTS: History; Clays and refractories; Furnaces and lehrs; Air compression systems; Electrical equipment; Gas producers; Producer gas vs. natural gas; Other fuels; Raw materials; Coloring agents; Calculations; Composition; Preparation of the batch; Melting and refining; Furnace control (pyrometry); Working the glass; Annealing; Physical and chemical properties; Plate glass, Window glass, Wire and reinforced glass; Bottle glass; Chemical vacuum and cooking ware; Table ware and cut glass; Art glass, Illuminating ware, Electric bulbs (including X-ray); Physical color analysis; Applications of illuminating engineering; Optical glass; Spun glass, Buttons and rod ware; Etching and sand blasting; Silvering—Metallic coatings; Glass substitutes; Decorative processes, Fused quartz, Labor and costs; Packing and shipping; Tables.

**SIMMONS, H. E.** Rubber Manufacture. 156 p. 4 to. 60 il. 1921. \$4.50

The cultivation, chemistry, testing and manufacture of rubber, with sections on reclamation of rubber and the manufacture of rubber substitutes. The entire rubber industry is completely discussed and the technical features of the subject presented so as to be of value to students and manufacturers.

CONTENTS: The history of Caoutchouc; Rubber of the Amazon Basin; African rubbers, including those from Madagascar, Central American rubbers; Rubber plantations and their development; Discussion of colloids; Colloidal action of crude rubber and its application to rubber manufacture; Different means of coagulation; Theory of the constitution of rubber; Synthetic Caoutchouc; Chemical and physical testing of crude rubber; The manufacture and use of inorganic fillers; The manufacture and use of organic accelerators; The methods of reclaiming rubber; Substitutes; Theory of vulcanization; Methods of reclaiming rubber; Preparation of crude rubber for manufacturing; The principles of compounding; Chemical analysis of manufactured rubber; Physical testing of compounded samples; Appendix; The laboratories and equipment of the Municipal University of Akron.

**SIMMONS, WILLIAM H.** Soap: Its Composition, Manufacture, and Properties. (Pittman's Common Commodities and Industries.) 124 p. il. 12 mo. 1920. \$1.00

CONTENTS: Introduction; Raw materials; Methods of soap-making; Toilet soap; Soap powders, Toilet soaps; The properties; Detergent action and commercial valuation of soap; Glycerine.

**SIMON, WILLIAM, and BASE, D.** Manual of Chemistry. Eleventh edition, revised. 648 p. 8 vo. 1917. \$7.50

**SINDALL, R. W.** The Manufacture of Paper. 285 p. 12 mo. il. 1908. \$3.00

CONTENTS: Historical notice. Cellulose and paper making fibres. The manufacture of paper from rags. Esparto and straw. Wood pulp and wood pulp papers. Brown papers and boards. Special kinds of paper. Chemicals used in paper making. The process of "beating." The dyeing and coloring of paper pulp. Paper mill machinery. The deterioration of paper. Bibliography of works relating to cellulose and paper making.

**SKINNER, EDMUND N., and PLATE, H. R.** Mining Costs of the World. 406 p. 12 mo. 1915. \$5.00

An engineer's and operator's pocket book, giving the production, costs and operating data of about 345 of the principal metal mines of the world. It contains a thorough compilation of operating results taken from the annual reports of mining companies and other reliable sources.

**SLOANE, T. O'CONOR.** Liquid Air and the Liquefaction of Gases. Third edition, revised and enlarged. 394 p. 12 mo. il. 1920. \$3.00

CONTENTS: Physics. Heat. Heat and Gases. Physics and chemistry of the air. Royal Institution. Michael Faraday. Early experiments. Raoul Pictet. Cailliet. Wroblewski and Olszewski. James Dewar. Tripler. Joule-Thomson effect. Linde apparatus. Applications of low temperatures. Claude and Linde. Utilization of atmospheric gases, helium, argon.

**SLOSSON, EDWIN E.** Creative Chemistry. 300 p. 8 vo. il. 1919. \$3.00

CONTENTS: Nitrogen, Feeding the soil; Coal tar colors, Synthetic perfumes and flavors, Cellulose, Synthetic plastics, The race for rubber, The rival sugars, What comes from corn, Solidified sunshine, Fighting with fumes, Products of the electric furnace; Metals, old and new.

**SMITH, ALEXANDER.** Introduction to Inorganic Chemistry. Third edition, rewritten. 925 p. 8 vo. 1917. \$3.75

CONTENTS: Chemical phenomena and the methods of studying and classifying them; Energy in chemical change; Physics in practical chemistry; Combining proportions by weight; Symbols, Formulas, Equations, Calculations; Oxygen; Measurement of quantity in gases; Hydrogen; Water; Relations between the structure and behavior of matter; The kinetic molecular viewpoint; Solution; Hydrogen chloride and Chlorine; Molecular weights and atomic weights; Applications of molecular and atomic weights; Properties of atoms; The halogen family; Chemical equilibrium; Groups and hydrogen peroxide; Dissociation in solution; Ionization; Ionic substances and their interactions; Sulphur and hydrogen sulphide; The oxides and oxygen acids of sulphur; Selenium and tellurium; The classification of the elements; Oxides and oxygen acids of the halogens; Oxidation and reduction; The atmosphere; The helium family; Nitrogen and its compounds with hydrogen; Oxides and oxygen acids of nitrogen; Phosphorus; Carbon and the oxides of carbon; The hydrocarbons; Illuminants; Flame; The carbohydrates, organic acids, alcohols, soap, colloids, foods; Silicon and boron; The base forming elements; Sodium and lithium; Ionic equilibrium considered quantitatively; Metallic elements of the alkalies; Calcium, strontium, barium; Copper, silver, gold, Magnesium, zinc, cadmium, mercury; The recognition of the cations in qualitative analysis; Electromotive chemistry; Aluminium and metallic elements of the earths; Germanium; Tin, lead, arsenic, antimony, bismuth; The chromium family; Radium; Manganese, Iron, cobalt, nickel; The platinum metals. Appendix.

**SMITH, A. W.** Principles of Electric Measurement. 243 p. 12 mo. il. 1914. \$2.25

**SMITH, EDGAR F.** Chemistry in America. Chapters from the history of the science in the United States. 309 p. 8 vo. il. 1914. \$3.00

CONTENTS: Contributions of America to chemistry; The Chemical Society of Philadelphia, James Woodhouse, Joseph Priestley, Thomas Cooper, John Maclean at Princeton, Robert Hart; Silliman's second visit to Philadelphia, Columbian Chemical Society founded in 1811; Leading chemists as mineralogists, Other eminent chemists

**SMITH, EDGAR F.** Electroanalysis. Sixth edition, revised and enlarged. 47 il. 8 vo. 357 p. 1918. \$3.50

CONTENTS: Sources of electric current, Magneto electric machines, dynamos, thermopile, storage cells, Reduction of the current, Rheostats, resistance frames, Measuring currents, voltmeter, voltmeter, ampere-meter; An electro-chemical laboratory, Historical sketch, Theoretical considerations; Rapid precipitation of metals in the electrolytic way, Use of mercury cathode; Determination of metals, Separation of metals, Additional remarks on metal separations, Determination of the halogens in the electrolytic way, Special application of the rotating anode and mercury cathode in analysis, Oxidations by means of the electric current, The combustion of organic compounds.

**SMITH, ERNEST A.** The Sampling and Assay of the Precious Metals. Comprising gold, silver, platinum, and the platinum group metals in ores, bullion, and products. 460 p. 8 vo. il. 1913. \$6.00

In the preparation of this work the aim has been to provide a full description of the various methods of sampling and assaying—both by the dry and wet methods—the precious metals contained in ores, bullion, and metallurgical products, and to produce a book useful alike to the student and to the assayer in practice. Special attention has been devoted to sampling, which the author considers of great importance.

**SMITH, ERNEST A.** The Zinc Industry. 231 p. 8 vo. il. 1918. \$3.75

CONTENTS: The history of zinc, The rise and progress of the production of zinc, Zinc ores and their sources of supply; The marketing of zinc ores; The smelting of zinc ores, Other methods of zinc production; The physical and chemical properties of zinc; The marketing of zinc; The industrial applications of zinc; Industrial zinc alloys; Commercial compounds of zinc; Zinc pigments.

**SMITH, HENRY C.** *Lecture Notes on Chemistry for Dental Students*, including dental chemistry of alloys, amalgams, etc., such portions of organic and physiological chemistry as have practical bearing on the subject of dentistry. An inorganic qualitative analysis with specially adapted blowpipe and microscopical tests, and the chemical examination of urine and saliva. By H. Carlton Smith, Ph.D., Lecturer on Physiological and Dental Chemistry at Harvard University Dental School, etc. Third edition, revised and enlarged. 455 p. 8 vo. il. 1917. \$4.00

**SMITH, J. C.** *Manufacture of Paint*. Second edition. 300 p. 8 vo. 1917. \$5.00

**CONTENTS:** Definitions. Storing and handling raw materials. Testing and valuation of raw material. Plant and machinery. Grinding of white pigments. Grinding of earth pigments. Grinding of oxide of iron pigments. Grinding of chemical pigments. Grinding in water, in turpentine, goldsize and special mediums. Mixed or prepared paints. Enamels and enamel paints. Designing, testing and matching of paints. Economic and general considerations. Index.

**SMITH, J. REGINALD.** *Modern Assaying*. A concise treatise describing the latest methods and appliances. Edited by F. W. Braun. 145 p. 8 vo. il. 1910. \$1.50

The aim of this book is to present in an intelligible and non-technical manner the science and methods of assaying. It is especially intended for the busy man whose time has been and is so occupied with other duties that it is impossible for him to devote his attention to technical work on assaying, and to the man who desires an insight into the practical methods of assaying in the shortest time possible.

**CONTENTS:** Selection and preparation of sample. Fire assay for gold and silver. Scorification assay. Assay of gold bullion. Fire assay of lead. Fire assay of antimony. Weighing. Fluxes. Touch stone and test needles. Volumetric determination of copper with solution of potassium cyanide. Modification of Kell's Swedish copper assay. Electrolytic assaying with the Gouss-Haultain electrolytic outfit. Wet assay of lead. Volumetric determination of lead by the molybdate method. Distilled water. Mercury determination of distillation. Whittom's method of mercury determinations. Retorting amalgam and melting bullion. Care of muffle and furnace. Accidents. Ozone. Reference tables and information.

**SMITH, ROBERT H.** *The Calculus for Engineers and Physicists*. Second edition. 207 p. 8 vo. il. 1908. \$3.00

**CONTENTS:** Part I.—Introductory. General ideas and principles. Algebraic and graphic symbolism. Easy and familiar examples of integration and differentiation. Important general laws. Particular laws. Transformations and reductions. Successive differentiation. Important general laws. Particular laws. Transformations and reductions. Successive differentiation and multiple integration. Independent variables. Maxima and minima. Integration of differential equations. Part II.—Classified reference tables of integrals and methods of integration in eleven sections. Notation. General theorems. Methods of transformation. Tables of integrals. Reduction formulae. Differential equations.

**SMITH, ROBERT H.** *Commercial Economy in Steam and Other Thermal Power-Plants*. 315 p. 8 vo. 1905. \$7.00

**CONTENTS:** Introductory. Products, profit, and economy. Commercial economy coefficient. Dynamic and thermal action. Physical data. Furnace, boiler, and engine efficiencies. Costs. Capital outlay and working expenses. Steam, gas, and oil plants. Electric power stations. Depreciation. Kinetic energy and resilience. Kinetic trans. Stream and strain specific heats. Analysis into thermal and mechanic elements. Dynothermic coefficient. First adjustment of size for maximum economy. Dynothermic coefficients of steam, work, heat, and costs of actual indicator diagrams. Partial limit values of bulk, initial pressure, and back pressure of maximum commercial economy. Combinations of heat values for maximum commercial economy. Furnace temperature and working speed for maximum economy.

**SMITH, W.** *Chemistry of Hat Manufacturing*. Revised and edited by Albert Shonk. 131 p. 12 mo. 1912. \$3.50

**CONTENTS:** Textile fibres, principally wool, fur and hair; Water, its impurities and their action. Acids and alkalies; Boric acid; Borax; Soap; Shellac; Wood spirit; Stiffening and proofing process; Mordants; Dye-stuffs and colors; Dyeing of wool and fur; Optical properties of colors.

**SMYTHE, J. A.** *Lead*. (Pitman's Common Commodities and Industries.) 120 p. il. 12 mo. 1920. \$1.00

**CONTENTS:** History of lead; Lead ores. Their method of occurrence and mineral associates. The mining and mining of lead ore and the preparation of the ore for smelting; The chemical changes involved in smelting. Smelting in the ore-hearth; Smelting in the reverberatory furnace; Smelting in the blast furnace; Condensation of lead fume; Softening and dealydrization of work lead, Cupellation of alloys of silver and lead; Properties and uses of lead and its alloys; Compounds of lead litharge and red lead. White-lead and other lead pigments, Lead in medicine, and lead poisoning.

**SNOW, CHARLES HENRY.** *Wood and Other Organic Structural Materials*. 478 p. 8 vo. il. 1917. \$5.00

For engineers, architects, technical students, and teachers of manual training. Of its 478 pages, 376 are devoted to wood, its classification, properties, and descriptions of the various species, with chapters on failures and means of preservation. The last three chapters relate to oils, paints, varnishes, adhesives, and india rubber. Bibliographies, p. 437-445. Author is Dean of the School of Applied Science, New York University.

**SOLOMON, HENRY G.** *Electricity Meters*. A treatise on the general principles, construction, and testing of continuous current and alternating current meters, for the use of electrical engineers and students. 332 p. 8 vo. il. 1906. \$5.00

Although the electricity meter forms the most important link in the chain connecting the supply station with the consumer, comparatively little has been written on the subject. The present work may supply what is wanting in this respect; some original matter may be found, especially in connection with the limitations of three-wire meters, of single-phase meters for polyphase circuits, and the results obtained with polyphase meters incorrectly installed.

No pains have been spared to make each chapter as comprehensive and complete as practicable within the scope of the book, and to

separate the mathematical principles from the purely descriptive matter. The latter is not possible, however, in treating polyphase meters.

**CONTENTS:** Introductory and general remarks. General principles of continuous current meters. Continuous current quantity meters. Continuous current energy motor meters. Continuous current energy meters of different types. Continuous current meters for special purposes. General principles of single phase and polyphase induction meters. Single-phase induction meters. Polyphase meters. Tariff systems. Prepayment meters. Tariff and hour meters. Some mechanical features in meter design. Meter testing. Appendix. Index.

**SOMERMEIER, E. E.** *Coal; its composition, analysis, utilization and valuation*. 175 p. 8 vo. il. 1912. \$2.50

**CONTENTS:** I.—Composition and heating value. II.—Chemical analysis of coal. III.—Sampling. IV.—Methods of analysis. V.—Determining the calorific value. VI.—Summary of chemical determination of coals. VII.—Improvement of coal by washing. VIII.—Purchase of coal under specifications. IX.—Flue gas analysis. X.—Analytical tables.

**SORSBIE, R. F.** *Geology for Engineers*. 423 p. 8 vo. il. 1911. \$3.75

**CONTENTS:** Part I.—Dynamical and structural geology. Chapter I. Changes on the earth's surface. Chapter II.—Changes within the earth. Chapter III.—Structural characters of rocks. Part II.—Rocks and minerals. Chapter IV.—The study of minerals. Chapter V.—Rock forming minerals. Chapter VI.—The study of rocks. Chapter VII.—Rocks. Part III.—Historical geology. Chapter VIII.—Principals of stratigraphy and paleontology. Chapter IX.—The Geological systems. Part IV.—Geological observation. Chapter X.—Outdoor work. Chapter XI.—In-door work. Part V.—Practical Geology. Chapter XII.—Water supply. Chapter XIII.—Building stones. Chapter XIV.—Bricks and clays. Chapter XV.—Limes, cements, and plasters. Chapter XVI.—Roads and canals. Chapter XVII.—Rivers. Chapter XVIII.—Coast erosion. Chapter XIX.—Uses of minerals. Index.

**SOSMAN, ROBERT B.** *The Properties of Silica and the Silicates*. About 500 p. 8 vo. il. Ready about December 1, 1921. American Chemical Society Monograph.

**CONTENTS:** Silica, Physical and Chemical Properties. Silica, Natural Occurrence and Industrial Uses; Alumina, Magnesia, and Lime; Oxides of Iron; General Properties of 2-Component Systems of the Common Oxides; The System  $\text{SiO}_2\text{-Al}_2\text{O}_3$ , Clays. The System  $\text{SiO}_2\text{-MgO}$ . The System  $\text{SiO}_2\text{-CaO}$ . Sand lime brick; The Systems  $\text{SiO}_2\text{-Na}_2\text{O}$  and  $\text{SiO}_2\text{-K}_2\text{O}$ ; The Systems  $\text{Al}_2\text{O}_3\text{-MgO}$ ;  $\text{Al}_2\text{O}_3\text{-CaO}$ , and  $\text{MgO-CaO}$ ; Spinel and spinel refractories; The Systems  $\text{MgO-Fe}_2\text{O}_3$  and  $\text{CaO-Fe}_2\text{O}_3$ ; Magnesite brick; General Properties of 3-Component Systems of the Common Oxides. The System  $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-MgO}$ . The System  $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-CaO}$ ; Portland cement; The System  $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-K}_2\text{O}$ ; Potash feldspars; The Systems  $\text{SiO}_2\text{-CaO-Na}_2\text{O}$  and  $\text{SiO}_2\text{-CaO-K}_2\text{O}$ ; Common glass; The System  $\text{SiO}_2\text{-CaO-FeO}$ ; Copper slags, etc.; General Properties of 4-Component Systems of the Common Oxides; The System  $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-MgO-CaO}$ ; Blast furnace slags; The System  $\text{SiO}_2\text{-Al}_2\text{O}_3\text{-Na}_2\text{O-K}_2\text{O}$ ; Porcelain; etc.; General Properties of Silicate Glasses, Silicates of the Rarer Elements; Silicates of La, Rb, and Cs; Silicates of Sr and Ba, Silicates of Zn and Cd; Borosilicates; Titanosilicates, Silicates of Mn, Ni, Co, and Cu; Silicates of Pb and Ti; Silicate Systems Containing Water; Colloidal Silica; Hydrated Silicates; Silicate Rocks.

**SOUTHCOMBE, J. E.** *Chemistry of the Oil Industries*. 200 p. 8 vo. il. 1913. \$3.50

**CONTENTS:** Introductory organic chemistry. Mineral oils. Petroleum and shale mineral oil refining. Natural sources and methods of separation of saponifiable oils and fats. Impurities occurring in crude oils and fats and the technical methods of removing them. Composition and properties of the saponifiable oils and fats in general. Composition and properties of the individual oils and fats of commercial importance. The natural waxes, their composition and properties. Analytical methods. Industrial applications of fats and oils. Burning oils. Edible oils and margarines. Polymerised, boiled and blown oils. Turkey red oils. Saponification of fats and oils on a technical scale. The distillation of fatty acids. Oleines and stearines. Candle manufacture. Soap-making. Glycerine. Conclusion. Scientific and technical research on problems in the oil and related industries. Literature.

**SPENCER, G. L.** *A Handbook for Cane-Sugar Manufacturers and Their Chemists*. By Guilford L. Spencer, D.Sc., Chief Chemist in Charge of Manufacture, Cuban-American Sugar Co. Sixth edition, enlarged. 561 p. 16 mo. il. 1917. Flexible "Fabrikoid" binding. \$4.00

An outline of the processes of the manufacture of cane-sugar from the cutting of the raw material to the last operation in the warehouse, together with methods of sugar analyses.

**CONTENTS:** Manufacture of cane-sugar. Extraction of the juice. Purification of the juice. Filtration of the juice and scums. Chemical reagents used in purifying the juice. Evaporation of the juice. Preservation of the juice and sirup. Crystallization of the sugar. Curing the sugars. Composition of the sugar-cane and molasses. General analytical work.

**SPENCER, G. L.** *A Handbook for Chemists of Beet-Sugar Houses*. By Guilford L. Spencer, D.Sc. 475 p. 16 mo. il. 1910. Flexible "Fabrikoid" binding. \$4.00

Treats of seed-culture farms and contains selected methods of analysis, sugar-house control, reference tables, etc.

**CONTENTS:** Sugar-house control. Weights and measures. Estimation of losses of sucrose. Sugar analysis. Sampling and averaging. Density determinations. Analysis of the beet, juice, sirup, massecuites and molasses, sugars, filter press cake, filter residues, wash and waste waters, exhausted cosette. Coefficients and terms used in sugar analysis. Determination of the marc. Viscosity of sugar-house products. Control of the osmosis process. Analysis of the saccharates. Examination of bone-black. Analysis of the lime-kill and chimney-gases. Analysis of limestone, lime, sulphur, coke, lubricating oils, water. Seed selection and testing.

**SPENCER, GUILFORD L.** *Manual de Fabricantes de Azúcar de Caña*. Traducción Autorizada de la 6a Edición Ingles, Por el Dr. Gaston Alonso Cuadrado, Director de la Escuela Azucarera de la Habana. 617 páginas. 8 vo. 97 grabados. Ribete flexible "Fabrikoid." \$5.00

El desarrollo extraordinario que ha tomado la industria en los países Hispano-Americanos impone desde hace tiempo la necesidad de publicar



una edición española del libro del Dr. Guilford L. Spencer, porque no existe libro alguno en nuestra idioma que embarque en sus páginas de un modo conciso y científico el desarrollo de la manufactura en todas sus fases desde que se muelen la planta hasta que se halla envasado el producto y dispuesto para el consumo.

**SPENCER, L. J.** *The World's Minerals.* 327 p. 8 vo. 1911. \$3.00

**SPENCER, JAMES F.** *Metals of the Rare Earths.* 279 p. 8 vo. 1919. \$4.50

CONTENTS: History of the discovery of the rare earths. Occurrence of the rare earths in nature. Separation of the rare earths. Methods of controlling the fractionation of the rare earths. The Cerium group of rare earths. The Yttrium group of rare earths. Thorium. Atomic weight determinations. Rare earths and the Periodic System. Uses of the rare earths. References. Reference index. Name index. Subject index.

**SPRINGETT, B. H.** *Cold Storage and Ice-Making.* (Pittman's Common Commodities and Industries) 122 p. il. 1921. \$1.00

CONTENTS: Introduction. Terms used in mechanical refrigeration. Principles of mechanical refrigeration. Ammonia compression refrigerating machines. The ammonia condenser or refrigerator or evaporator. Brine. Insulation. Other systems of mechanical refrigeration. Ice making. The cold store. Applications of mechanical refrigeration. The frozen-meat trade.

**STANDAGE, H. C.** *Agglutinants of All Kinds for All Purposes.* 267 p. 8 vo. 1907. \$3.50

CONTENTS: Reticular cements. Agglutinants of different kinds for use by carpenters, painters, decorators, bricklayers, plasterers and stonemasons. Agglutinants adapted for use in paper, printing, photographic, leather and kindred trades. Compounds used in textile industries. Cements for the metal workers. Notes on the materials used.

**STANDAGE, H. C.** *Cements, Pastes, Glues, and Gums.* A practical guide to the manufacture and application of the various agglutinants required in the building, metal, wood and leather trades, etc. With upwards of nine hundred recipes and formulas. 171 p. 16 mo. 1916. \$1.25

CONTENTS: Hints on the application of cements. Acid, spirit and water-proof cements. Building cements, plaster, etc. Cements and pastes for chemists, electricians, naturalists, etc. Cements for china, glass and earthenware. Cements and glues for the leather trades. Cements for the metal workers' use. For woodworkers. Glues for various purposes. Office paste, gums and wafers. Miscellaneous recipes.

**STANDAGE, H. C.** *Leatherworkers' Manual.* Second Edition. 175 p. 8 vo. 1900. \$4.50

CONTENTS: Blackings, Polishes, Glosses, Dressings, Renovators, etc. for Boot and Shoe Leathers. Harness Blackings, Dressings, Glosses, Compositions, Soaps, and Boot Top Powders and Liquors. Leather Grinders, Sundries, Curriers Seasonings, Blacking Compounds, Dressing Finishes, Glosses; Dyes and Stains for Leathers; Chrome Tannage; Useful information.

**STANDAGE, H. C.** *Sealing Waxes, Wafers, and Other Adhesives.* For the household, office, workshop and factory. 96 p. 12 mo. 1903. \$2.50

CONTENTS: Sealing waxes and their manufacture. Wafers. Notes on the nature of the materials used in making adhesive compounds; Cements for use in the household, Office gums, pastes and mucilages. Adhesive compounds for factory and workshop use.

**STANSFIELD, ALFRED.** *The Electric Furnace, its evolution, theory and practice.* 415 p. 8 vo. il. 1914. \$5.00

The first edition of this work met with much favor. In the present edition the author covers the great advance in practice and equipment. It is three times as large as the first edition. It is a full statement of present-day practice.

CONTENTS: I.—Historical. II.—Description and classification of electric furnaces. III.—Efficiency of electric and other furnaces, and relative cost of electrical and fuel heat. IV.—Construction and design. V.—The operation of electric furnaces. VI.—Laboratory furnaces. VII.—The production of pig iron in the electric furnace. VIII.—The production of steel from iron ore. IX.—The ferroalloys and silicon. XI.—Graphite and carbides. XII.—The electric smelting of zinc and other metals. XIII.—Miscellaneous uses of the electric furnace. XIV.—Electrolysis and electrolytic processes. XV.—Future developments of the electrical furnace.

**STECHER, GILBERT E.** *Cork; Its Origin and Industrial Uses.* 94 p. 8 vo. il. 1914. \$1.00

CONTENTS: Quercus suber (cork); Quercus lber (hinnaeus). Cork, Origin, including the territory of growth and attempts to transplant the seed; The tree and growth. Diseases; Stripping. Botany and chemistry, including compression diagram; Uses and application. Substitutes; Manufacture. Raw stock, sorting, stopper making, cork disc making, waste utilization; Extent of the manufacturing industry.

A concise, plain story of the corkwood stopper about which there seems to be no written information extant. In the discussion of the origin of cork the author details the territory in which corkwood grows and explains the various attempts that have been made to transplant the seed. The tree, its growth and diseases are explained, and the uses, application and substitutes for the corkwood are taken up in detail. The methods of manufacture and the utilization of waste receive generous treatment.

**STEDMAN, THOMAS L.** *A Practical Medical Dictionary;* words used in medicine with their derivation and pronunciation. Fourth revised edition. Including dental, veterinary, chemical, botanical, electrical, life insurance and other special terms; anatomical tables of the titles in general use, and those sanctioned by the Basle Anatomical Convention; pharmaceutical preparations, official in the U. S. and British Pharmacopoeias and contained in the National Formulary; chemical and therapeutic information as to mineral springs of America and Europe, and comprehensive lists of synonyms. 1110 p. 8 vo. il. 1916. \$5.00

**STEIN, MILTON F.** *Water Purification Plants and Their Operation.* 258 p. 8 vo. 1920. \$3.00

In this second edition, parts have been entirely rewritten, to agree with the new and somewhat different viewpoint as to the interpretation of bacteriological tests of water.

CONTENTS: Water and its impurities. Types of purification plants. Physical and chemical tests. Bacteriological testing of water. Interpretation of tests. Coagulation and sterilization. Water softening. Filtration and general operation. Appendices. Index.

**STEVENS, H. P.** *Paper Mill Chemist.* Second edition. 325 p. 12 mo. il. 1919. \$4.00

CONTENTS: English and metrical systems of weights and measures. Methods of chemical analysis. Weighing. Drying. Evaporation. Precipitation and filtration. Notes and calculations. Use of hydrometers. Fuels. Methods of sampling. Darling's calorimeter. Water analysis. Softening and purification. Automatic filters. Raw materials and detection of adulterants. Properties and analysis of lime, soda, caustic alkali, mineral acids, bleach, antichlor, alum, rosin and rosin size, glue, gelatine, casein, starch. Mineral loading. Coloring matters. Ammonia solution. Copper sulphate. Tannic acid. Coal tar dyer. Fibrous raw materials half stuffs and their treatment. Cellulose and the isolation of paper making fibres. Examination and properties of rags and rag fibres. Rag boiling. Pulp woods. Mechanical, sulphite, and sulphate pulps. Straw and esparto pulp. Soda recovery. Bleaching fibres. Paper analysis and paper testing. Microscopic examination and identification of fibres. Determination of percentage composition of furnish paper testing. Blotting papers. Chemical analysis of paper. Chemical impurities in paper. Sizes and weights of papers. Conversion of team weight to metric units and vice versa. Paper trade customs.

**STEVENS, H. P., and BEADIE, CLAYTON.** *Rubber Production and Utilization of the Raw Product.* (Pittman's Common Commodities and Industries) 138 p. il. 12 mo. 1920. \$1.00

CONTENTS: Part I. The Raw Material. Introductory. The Para rubber tree and rubber latex. Other rubber yielding trees. Part II. Manufacturing Processes. Preliminary treatment. Compounding and mixing. Ingredients and mixing. The vulcanization process. Mechanicals. Rubber solution and its application. Cut sheet. Cold curing of India rubber. Miscellaneous rubber goods; Vulcanite. Direct utilization of rubber latex. Trade customs and the present position of plantation rubber.

**STEVENSON, J. L.** *Blast Furnace Calculations.* 160 p. 12 mo. il. 1906. \$2.50

CONTENTS: Analyses of coke, and ores. Size of furnace required; To find working capacity. Burden capacity. Calculations of cubical contents of 18" x 80" furnace. Volume by method of conical frustum. Burden capacity per ton of iron, commencing the designing. Furnace bosh. Furnace height; Hearth. Slag tye, Tuyere, Tuyere. Stove power and heating surface. Air capacity required; Changes in temperature. Summary of power required for any output per furnace per day. Section of 260 tons furnace. Pig iron. Analyses for comparison; Pig iron for castings. Ores suitable for Bessemer process. Purple ores; Swedish ores. Manganese and iron; Sundry analyses; Forms for recording results of operations.

**STEWART, ALFRED W.** *Recent Advances in Organic Chemistry.* With an introduction by J. Norman Collie. Fourth edition. 370 p. 8 vo. 1920. \$7.50

CONTENTS: Introduction. Organic chemistry in the twentieth century. The monocyclic terpenes. The bicyclic terpenes. The olefinic terpenes. Rubber. The alkaloids. The polypeptides. The chlorophyll problem. The anthocyanins. Some theories of the natural syntheses of vital products. Trivalent carbon. Other elements which exhibit abnormal valency. Modern formulas and their failings. Some unsolved problems.

**STEWART, ALFRED W.** *Recent Advances in Physical and Inorganic Chemistry;* with an introduction by Sir William Ramsay. 284 p. 8 vo. il. 1919. \$6.50

CONTENTS: The electric furnace. Fixation of nitrogen. Perinutic. Peroxides and peracids. Active nitrogen. Absorption spectra. X-rays and some atomic properties. X-rays and crystal structure. X-ray spectra and atomic numbers. Elements of rare earths. In condensed gas mantles. Pseudoacids. Inactive gases. Positive ray analysis. Radioactivity. Isotopes and Soddy's law. The elements Index.

**STEWART, R. WALLACE.** *An Elementary Textbook of Physics.* In four volumes. 12 mo. Sold separately

Part I.—General physics  
CONTENTS: Introductory. Scalar and vector quantities. Measurement of length, area and volume. Measurement of time. Measurement of mass. Velocity. Acceleration. Circular motion and simple harmonic motion. Force. Work and energy. Composition and resolution of forces. Centre of gravity. Equilibrium of forces. Friction. The balance. General properties of matter. Properties of solids. Hydrostatics. Experimental determination of specific gravity and density. Properties of liquids. Properties of gases. Index. 414 p. 12 mo. 1910. \$2.00

Part II.—Sound. An exposition of the fundamental facts and principles of sound. The experiments described in the text are intended to illustrate and develop the theory, but in most cases the descriptions are given with sufficient experimental detail to be of service in the laboratory.  
CONTENTS: Simple harmonic vibrations. Production of sound. Wave motion. Propagation of sound. Characteristics of sound. Reflection and refraction of sound. Velocity of sound in air and water. Transverse vibration of strings. Longitudinal vibrations of rods and columns of air. Index. 141 p. 12 mo. 1909. \$1.25

Part III.—Light. In accordance with the plan of the text-book the treatment is of a strictly elementary character, and deals only with the fundamental groundwork of light. The experiments are of a very simple character, and can, in most cases, be carried out with comparatively simple apparatus. 142 carefully prepared diagrams illustrate the text.  
CONTENTS: Introductory. Rectilinear propagation of light. Photometry. Reflection at plane surfaces. Reflection at spherical surfaces. Refraction. Refraction through lenses. Dispersion. Index. 219 p. 12 mo. 1909. \$1.50

Part IV.—Heat.  
CONTENTS: Introductory. Thermometry. Expansion of solids. Expansion of liquids. Expansion of gases. Calorimetry. Specific heat

Liquefaction and solidification. Vaporization and condensation. Conduction of heat. Convection. Mechanical equivalent of heat. Radiation. Index. 246 p. 12 mo. 1910. \$1.50

**STILLMAN, THOMAS BLISS.** Engineering Chemistry. 760 p. 8 vo. 1916. \$6.00

Fifth edition of this well known guide to the testing and examination of engineering materials. Although the author died in August, 1915, at a time when a complete revision was well under way, the work was continued by his two sons in a thorough and satisfactory manner. For a statement of the many changes made see the *Engineering News* for February 15, 1917. A notable feature of the work is a number of lag U. S. Navy specifications. Also revised in *Life and Refrigeration*, March, 1917.

**STILLMAN, T. B.** Examination of Lubricating Oils. 125 p. 8 vo. 1918. \$1.75

CONTENTS: Specific gravity; Cold test; Viscosity; Iodine absorption; Flash and fire test; Acidity; Maumene's test; Color reactions of oils with nitric and sulphuric acids; Separations of mineral oil from a vegetable or animal oil; Gumming test; Sulphur test; Test for water; Gasoline test; Microscopical examination; Carbon residue test; Fixed carbon in oil; Estimation of paraffin in mineral oils; Soap test; Determination of tarry matters in petroleum products; Greases; Coefficient of friction; Specifications for various lubricating oils; Graphite as a lubricant; Remarks on lubricating oils; The calorific power of petroleum oils and the relation of density to calorific power; Fuel oil specifications; The analysis of lubricating oils containing blown rapeseed and blown cottonseed oils; The analysis of cylinder deposits; Technical examination of petroleum; Table of approximate composition of the crude oils of the United States; Table of products obtained from Pennsylvania crude petroleum when distilled destructively; Table for comparison of centigrade and Fahrenheit degrees; Wholesale prices current; Apparatus for the examination and study of the behavior of valve and cylinder oils and other petroleum and lubricating oils in saturated and superheated steam, carbon dioxide, air and other gases; References.

**STOCKING, W. A.** Manual of Milk Products. 578 p. 12 mo. 1917. \$2.00

**STOCKS, HERBERT B.** Water Analysis for Sanitary and Technical Purposes. 144 p. 12 mo. 1912. \$2.00

CONTENTS: Introduction. Part I.—Physical Examination. Part II.—Quantitative analysis for sanitary purposes. Quantitative analysis of the mineral constituents. Deleterious metals. Gases contained in solution. Appendix 1—Standards of purity recommended by the rivers pollution commissioners. Appendix 2—Tabular view of the standards for effluents adopted by various authorities. Appendix 3—Average composition of unpolluted water. Appendix 4—Tension of aqueous vapour. Appendix 5—Reduction of cubic centimetres of nitrogen to grams. Appendix 6—Loss of nitrogen by evaporating of  $\text{NH}_4\text{HSO}_4$ . Appendix 7—Loss of nitrogen by evaporation of  $\text{NH}_4\text{H}_2\text{PO}_4$ . Appendix 8—Warrington's method of estimating nitrate. Table of converting c. c. of indigo solution to pts. of N. per 100,000. Appendix 9—Table of hardness. Appendix 10—Preparation of reagents required for water analysis. Index.

**STODDART, C. W.** Chemistry of Agriculture. 364 p. 8 vo. 1915. \$2.00

**STOEK, H. H.** The Storage of Bituminous Coal. 102 p. 8 vo. 1918. \$0.40

**STORER, F. H.** Agriculture in Some of Its Relations to Chemistry. Seventh edition, revised. 3 vols. 8 vo. 1917. \$12.00

**STOUGHTON, BRADLEY.** Metallurgy of Iron and Steel. 517 p. 8 vo. 1911. \$4.00

CONTENTS: Iron and carbon. Manufacture of pig iron. Purification of pig iron in general. Manufacture of wrought iron and crucible steel. Bessemer process. Open hearth or Siemens-Martin process. Defects in ingots and other castings. Mechanical treatment of steel. Iron and steel founding. Solution theory. Constitution of steel. Constitution of cast iron. Malleable cast iron. Heat treatment of steel. Alloy steels. Corrosion of iron and steel. Electrometallurgy of iron and steel. Metallurgy of iron and steel. Metallurgical fuels and refractories. Chemistry and Physics. Introductory to metallurgy.

**STROHM, R. T.** Oil Fuel for Steam Boilers. 145 p. 12 mo. 1914. \$1.50

A clear, simple statement of principles that underlie the burning of oil in the furnaces of stationary steam boilers.

CONTENTS: I.—Properties of oil fuel. II.—Requirements for efficient burning of oil fuel. III.—Methods of spraying oil fuel. IV.—Burners for oil fuel. V.—Cleaning of oil fuel. VI.—Pumping and heating of oil fuel. VII.—Oil burning furnaces. VIII.—Installation of oil burners. IX.—Storage of oil fuel. X.—Combustion of oil fuel. XI.—Management of oil burning plants. XII.—Purchase of oil fuel. XIII.—Advantages and disadvantages of oil fuel. XIV.—Performances of oil burning boilers.

**SULLIVAN, T. J.** Sulphuric Acid Handbook. By Thomas J. Sullivan of the Mineral Point Zinc Co. (a subsidiary of the New Jersey Zinc Company). 239 p., pocket size, flexible binding. 1918. \$2.50

The first handbook of the numerical data—tables, formulas and calculations—needed by chemists interested in the manufacture and use of sulphuric acid. The material is based on the best modern American practice. It presents in compact, accessible form the data most frequently required in sulphuric acid calculations.

CONTENTS: Sulphuric acid nomenclature. Sulphuric acid formulas and calculations. Formation of solutions of sulphuric acid of definite strength. Mixed acid formation calculations. Standard nitric, hydrochloric and sulphuric acid tables. Fuming sulphuric acid tables. Miscellaneous sulphuric acid tables. Yield of sulphuric acid from sulphur. Analysis of burner gas. Conversion of sulphur dioxide to sulphur trioxide. Analysis of sulphuric acid. Analysis of mixed acid. Calibration of tanks. Mathematical tables. Standard lead, cast iron and steel pipe. Standard flanged and screwed fittings. Standard sheet lead. Standard brick shapes. Baumé and Twaddle formulas and scales.

**SUMMERS, A. LEONARD.** Asbestos and the Asbestos Industry. (Pitman's Common Commodities and Industries.) 107 p. 1919. \$1.00

CONTENTS: Asbestos; Crude asbestos; Miscellaneous uses for asbestos; Composite fireproof materials.

**SUPINO, GIORGIO.** Land and Marine Diesel Engines. 389 p. 8 vo. 1915. \$5.00

**SUPLEE, HENRY HARRISON.** The Mechanical Engineer's Reference Book. Fourth enlarged edition. 964 p. 12 mo. 1913. \$5.00

A handbook of tables, formulas, and methods for engineers, students, and draftsmen. CONTENTS: Mathematics—Factor tables. Powers and roots. Interest. Weights and measures. Monetary systems, etc. Mechanics—statics. Funicular polygons. Centre of gravity. Statics of framed structures. Wind stresses, etc. Materials of engineering—Specific gravity. Weight of iron. Weight of sheet metal. Weight of spheres. Weight of cast iron pipe, etc. Machine design—Riveting. Bolts. Keyed fastenings. Journals, etc. Heat—Thermometers. Coefficients of expansion. Fusing points. Expansion of gases, etc. Air-compression and expansion of air. Air transmission. Compressed air. Flow of air, etc. Water—Tables and properties of water. Water heads and pressures. Water heads and velocities. Flow of water through pipes, etc. Fuel. Calorific values of fuel. Heating values of coals. Liquid fuels. Gas fuels. Steam—Steam tables. Flow of steam. Moisture in steam. Steam boilers. Factors of evaporation. Boiler trials. Chimneys. Chimney flues, etc. Steam engines—Hyperbolic logarithms. Expansion of steam. Economical point of cut off. Multiple expansion engines. Indicator diagrams. Engine performance, etc. Internal-combustion motors—Gas engines. Gas engine testing. Electric power—Electric cables. Wire tables. National electric code. Wiring formulae. Standardization, etc. The cost of power—Water power. plant costs. Water power costs. Summary of boiler tests. Summary of engine tests. Steam plant costs, etc. Index.

**SUTERMEISTER, E.** Chemistry of Pulp and Paper Making. 479 p. 8 vo. 55 figures and 31 full page photomicrographs. \$6.00

Gives sufficient details of manufacture to afford chemists a satisfactory understanding of the chemistry involved. The book is so written that any one connected with the pulp and paper industry will find it helpful and suggestive. Based on personal notes and experience of twenty years, as well as a review of literature.

CONTENTS: Cellulose; Fibrous raw materials. Rags, esparto, straw, bamboo. The soda process; The sulphate process. The sulphite process. Ground wood or mechanical pulp. Bleaching, Sizing; Loading and filling materials. Coloring. Coated papers. Water, Testing wood pulps. Paper testing. Printing.

**SVENSEN, CARL L.** A Handbook on Piping. 359 p. 8 vo. 1918. \$4.00

Brings together in convenient form, and with a wealth of illustrations, a large amount of information concerning piping, fittings, pipe joints, valves, piping drawings, and pipe lines and their accessories. Tabular data have been arranged in a uniform manner and the names of the different companies given, thus obviating searches through trade catalogues. Covers steam, exhaust, condenser, feed water heater, heating, water, compressed air, gas and oil piping. Has chapters on erection, insulation, and specifications, an excellent bibliography, and an appendix showing plants and elevations of installations. Author is a professor in the Ohio State University.

**TABLES ANNUELLES DE CONSTANTS** et données numériques de chimie, de physique et de technologie. Années 1910, 1911, 1912. 3 vols. 8 vo. 1910-12. each \$7.20

**TAGGART, WILLIAM S.** Cotton Spinning. Fourth edition. 3 vols. 12 mo. 1917. \$9.25

**TAILFER, L.** Practical Treatise on the Bleaching of Linen and Cotton Yarn and Fabrics. Translated from the French by John G. McIntosh. 318 p. 8 vo. 1901. \$7.00

CONTENTS: General considerations of bleaching, steeping, washing, lye boiling, Mather and Platt's Keir, Soap; Bleaching on grass or on the bleaching green or lawn; Sour; Drying; Damages to fabrics in bleaching; Valuation of caustic and carbonated alkali. Chlorimetry or titration of decolorizing chlorides; Chlorine and decolorizing chlorides; Water, Bleaching of yarn; Installation of a bleaching works; Energy of decolorizing chlorides; Production of chlorine and hypochlorites by electrolysis. Bleaching by ozone.

**TALBOT, FREDERICK A.** Oil Conquest of the World. 320 p. 8 vo. 1914. \$1.75

**TANNER, A. E.** Tobacco: From Grower to Smoker. (Pitman's Common Commodities and Industries.) 118 p. 1920. \$1.00

CONTENTS: Historical sketch. Cultivation; Chemical changes in curing. In bond. British cigars. Cut tobacco. Roll, cake, twist, etc.; Virginian cigarettes. Turkish cigarettes; Cavendish and negrohead; Snuff. The tale of figures, Offals. Smuggling. Tariff and license duties.

**TANNER, FRED W.** Bacteriology and Mycology of Foods. 592 p. 12 mo. 1918. \$6.00

A book for those who wish to fit themselves for food control, food chemists, and for students in household science who possess a sufficient fundamental training in chemistry. The methods of analysis are presented, with sufficient discussion based on the literature of the subject, to show the history and "make-up" of these methods, without which their intelligent use would be difficult. Numerous references are given at the end of each chapter, increasing the usefulness of the book to both the practitioner and the student.

**TAYLOR, FREDERICK WINSLOW, and THOMPSON, S. E.** A Treatise on Concrete, Plain and Reinforced; materials, construction, and design of concrete and reinforced concrete, with chapters by R. Feret, William B. Fuller, Frank P. McKibben and Spencer B. Newberry. 885 p. 8 vo. 1916. \$6.00

Thoroughly revised and with 78 pages more than the second edition (1912), "Taylor and Thompson" retains its popularity as a standard practical work. Among the additions are new chapters on reinforced concrete, and a chapter on beam bridges. The chapter on building construction "has been rewritten and enlarged, giving, as illustrations, drawings of typical structures and many details showing methods of handling the design in the drafting rooms of the architect and the engineer." Chapter 3 includes the specifications for the reinforced concrete as used in the new buildings of the Massachusetts Institute of Technology.

**TAYLOR, HUGH S.** Industrial Hydrogen. American Chemical Society Monograph. About 300 p. 8 vo. il. 1921 \$3.50

CONTENTS: Introduction. Hydrogen from steam and iron. Hydrogen from water gas and steam. Hydrogen from water gas by liquefaction. Hydrogen by electrolysis. Hydrogen from water. Hydrogen from aqueous alkalis. Hydrogen from hydrocarbons. Miscellaneous and by product hydrogen processes. The purification and testing of hydrogen

**TAYLOR, W. W.** The Chemistry of Colloids; and some technical applications. 336 p. 12 mo. il. 1915. \$2.75

CONTENTS: General Properties of Colloids. General differences between suspensions and emulsions; Diffusion and dialysis. Osmotic pressure and molar weight. Optical properties. Brownian movements. Size of particles and filtration. Electrical properties. Precipitation. Properties of gels. Methods of Preparation. Crystallization methods. Solution methods; Electrical dispersion methods. Adsorption. Surface Phenomena. Surface concentration. Application of Colloid Chemistry. Semi-colloids; Dyeing; Tanning. The soil and purification of sewage. Applications of colloid chemistry to biology.

**TERRY, H. L.** India Rubber and Its Manufacture. With chapters on gutta-percha and balata. 294 p. 12 mo. il. 1920. \$3.50

CONTENTS: Introduction; Historical and general raw rubber; Botanic origin; Tapping the tree; Coagulation. Principal raw rubbers of commerce. Pseudo rubbers. Congo rubber. General considerations; Chemical and physical properties; Vulcanization. India rubber plantations; India-rubber substitutes; Reclaimed rubber. Washing and drying of raw rubber; Compounding of rubber. Rubber solvents and their recovery. Rubber solution; Fine cut sheet and articles made therefrom; Elastic thread. Mechanical rubber goods. Sundry rubber articles. India-rubber proofed textures. Tires. India rubber boots and shoes; rubber for insulated wires. Vulcanite contracts for india rubber goods; The testing of rubber goods. Gutta-percha, Balata. Bibliography.

**THALLNER, OTTO.** Tool-Steel. A concise handbook on tool-steel in general, its treatment in the operations of forging, annealing, hardening, tempering, etc., and the appliances therefor. Authorized translation by William T. Brannit. 180 p. 12 mo. il. 1902. \$2.00

**THATCHER, ROSCOE W.** The Chemistry of Plant Life. 286 p. 8 vo. 1921. \$3.00

The first American textbook devoted to the chemistry of plant cell activities. The book aims to furnish a proper foundation upon which to build a scientific knowledge of how plants grow

CONTENTS: Introduction; Plant. Nutrients. Organic components of plants; Photosynthesis. Carbohydrates. Gums, pectins and celluloses. Glucosides. Tannins. Pigments. Organic acids, acid salts and esters. Fats and oils, waxes and lipoids. Essential oils and resins. The vegetable bases; Proteins; Enzymes. The colloidal condition. The physical chemistry of protoplasm, hormones, auxinones, vitamins and toxins. Adaptations.

**THOM, C., and FISK, Wa. W.** The Book of Cheese. 392 p. 12 mo. il. 1916. \$2.90

Guide in interpretation of the processes of making and handling important varieties of cheese. Index. First author is investigator in cheese, formerly at Connecticut Agricultural College, second author is assistant professor of dairy industry, New York State College of Agriculture.

**THOMAS, EDWARD.** Chemical Patents and Allied Problems. 58 p. 1917. \$2.50

"The present book is more than a revision of my Process Digest, since it is entirely rewritten, all the cases being recast from the point of view of an attorney and expert witness, instead of that of a Patent Office Examiner. For this reason there are specific notes on the kind of evidence needed in chemical and allied cases, and also notes covering the cases on damages, licenses, etc. No attempt has been made to criticize any decision of the findings on which it is based. The book is intended as a statement of the law, with a practically complete 'finding list' of the cases on which the law of chemical patents is based, and it also includes the principal cases intimately related in reasoning to such cases."—Preface.

**THOMPSON, A. B.** Old Field Development and Petroleum Mining. 648 p. 8 vo. 1917. \$15.00

CONTENTS: Introductory; Customs, leasing and valuation of oil fields; Geological structure and lithological character of oil fields, and factors governing the distribution of petroleum; Indications of petroleum and phenomena associated with its occurrence; Typical oil field structures; Origin, composition, characteristics, and treatment of petroleum; Systems of drilling or boring for petroleum; Casing or lining tubes for wells and appliances employed in its insertion, manipulation, extraction, and repairs. Exclusion of water from oil wells. The extraction of petroleum and natural gas; Oilfield equipment. The measurement, collection, transmission, and utilization of natural gas; Compilation of statistical records; Oilfield organization and accounts.

**THOMPSON, M. D.** Applied Electrochemistry. 329 p. 8 vo. 1911. \$2.75

**THOMPSON, W. G.** The Occupational Diseases. 724 p. 8 vo. 1914. \$5.00

**THOMSON, F. A.** Stamp Milling and Cyaniding. 285 p. 8 vo. il. 1915. \$5.00

CONTENTS: Part I.—MILLING AND AMALGAMATION. I.—Gold and silver. II.—Principles of amalgamation. III.—The stamp mill and its accessories. IV.—Stamp mill amalgamation. V.—Variations in practice. VI.—Other mills and renders. VII.—Comparisons of various mills. Part II.—CYANIDING. VIII.—History and chemistry of cyaniding. IX.—Preparation of ores for cyanide treatment. X.—Dissolving the gold and silver. XI.—Separating solution and pulp. XII.—Precipitation of gold and silver. XIII.—Recovery and treatment of precipitate. Part III.—TREATMENT OF GOLD AND OF SILVER ORES. XIV.—Treatment of gold ores. XV.—Treatment of silver ores.

**THOMSON, J. H., and REDWOOD, BOVERTON.** Handbook on Petroleum. Third edition, revised, 340 p. 8 vo. il. 1913. \$4.50

For those engaged in the storage, transport, distribution and industrial use of petroleum and its products and calcium carbide. With

suggestions on the construction and use of mineral oil lamps. Revised and added to by Major A. Cooper-Key and Sir Boverton Redwood, Bart.

CONTENTS: Introductory. Sources of supply. Production, refining, marine transport. Storage and distribution. Commercial products of petroleum, shale oil, and coal tar. "Flash point" and "Fire test." Testing. Specific gravity. Boiling point. Other tests. Legislation relating to petroleum (historical). Existing legislation relating to petroleum. Precautions necessary for petroleum. Petroleum oil lamps. Carbide of calcium and acetylene. Appendices. Index.

**THOMSON, J. J.** Electricity and Matter. By Joseph John Thomson, D.Sc., LL.D., Ph.D., F.R.S. Fellow of Trinity College and Cavendish Professor of Experimental Physics, Cambridge University. 162 p. 12 mo. 1904. \$1.50

"The work is an admirable example of the best kind of scientific writing in its clearness and conciseness. It is possible for any one who has a slight knowledge of general physics to appreciate almost to the full the attractive ideas advanced and the cogent logic by which they are supported, while the more serious student will find many illuminating suggestions which might well have been hidden in a cloud of symbols. In short, Professor Thomson's book is one which no one who takes the slightest interest in contemporary science can possibly afford to leave unread."—The Athenaeum

**THORKELOSON, H. J.** Air Compression and Transmission. By H. J. Thorkeelson, Business Manager, formerly Professor of Steam and Gas Engineering, University of Wisconsin. 207 p. 8 vo. il. 1913. \$2.50

It gives a clear treatment of the fundamentals, and a comparison of systems, their advantages and limitations.

CONTENTS: I. Characteristics of air. II. Fundamental definitions. III. Characteristic and energy equations for air. IV. Graphical diagrams. V.—Air at pressures below the atmosphere. VI.—Air at low pressures. VII.—Piston compressors. VIII. Efficiency and energy compensation. IX. Multistage compression. X. Details of piston air compressors. XI. Turbo-compressors. XII. Hydraulic compression of air. XIII.—Effect of altitude and compressor tests. XIV.—Receivers. Measurement and transmission of compressed air. XV.—The selection and care of air compressors. Appendix A. Common logarithms. Appendix B. Napierian logarithms. Appendix C. Hygrometry.

**THORPE, E.** A Dictionary of Applied Chemistry. By Sir Edward Thorpe, CB, LL.D., F.R.S., assisted by eminent contributors. Sixth, new, revised and enlarged edition, to be published in six or possibly seven volumes. 8 vo. il. 1921. each, \$20.00

CONTENTS: Vol. I. A to calcium. Vol. II. Calcium to explosion. Vol. III. In preparation. Vol. IV. In preparation. Vol. V. In preparation. Vol. VI. In preparation.

**THORP, F. H., and Lewis, W. K.** Outlines of Industrial Chemistry. By Frank H. Thorp, Assistant Professor of Industrial Chemistry, and Warren K. Lewis, Professor of Chemical Engineering, in the Massachusetts Institute of Technology. 665 p. 8 vo. il. 1917. \$3.75

The great progress which has been made in Chemical Industry since the publication of the second edition of this work in 1904 has necessitated entire rewriting of many sections of the book, with elimination of much obsolete matter and the introduction of much new material. While the general plan of the former edition has been retained, in treating the various subjects use has been made of the modern concepts and theories of chemistry wherever these promised to make clearer the phenomena involved. The purpose is to impart to students and others not already familiar with the processes of chemical industry, some knowledge of the plant and methods employed in the more important manufacturing operations based upon chemical changes.

**THORPE, EDWARD.** History of Chemistry. Vol. I. From the earliest times to the middle of the nineteenth century. 210 p. 16 mo. 1909. \$1.00

**THORPE, E.** Alcoholometric Tables. By Sir Edward Thorpe, CB, LL.D., F.R.S., late Principal of the Government Laboratory, Emeritus Professor of Chemistry, Imperial College of Science and Technology, South Kensington, London. 105 p. 1915. \$1.50

The tables are intended to facilitate the accurate estimation of the strength of aqueous solutions of ordinary alcohol and, inferentially, of spirits in general, by means of specific gravity determinations made by the specific gravity bottle, or the so called pycnometer, or by the aid of Sikes's hydrometer.

**THUM, ERNEST E.** A Practice Book in Elementary Metallurgy. 313 p. 8 vo. il. 1917. \$2.75

CONTENTS: General rules and instructions. Furnace operations. Oxidizing reactions. Reducing atmospheres and reactions. Refractories. Slags. Thermo-couple elements. Thermo couple construction. The cooling curve of a pure substance. Thermo couple calibration. Lead antimony alloys. Metallography. Photo micrography. Hardness. Electric furnaces. Radiation and optical pyrometers. Transformation points. Crystallization of steel. Hardening of steel. Quenching media. Tempering and toughening. Tool making. Metallography of steels. Case carburizing. Corrosion. Molding. Composition of cast iron.

Appendix A. Elementary metallurgical calculations. Appendix B. Foundry practice. Glossary of terms in common use; Appendix C. General directions for written work

**TIEMANN, HARRY DONALD.** Kiln Drying of Lumber. 116 p. 8 vo. 1917. Second edition. \$4.50

**TIEMANN, HUGH P.** Iron and Steel. Second edition. 514 p. 16 mo. Flexible binding. 1919. \$4.00

**TILDEN, J. H.** Food: its composition, preparation and effects. 366 p. 12 mo. 1918. \$3.50

**TILDEN, WILLIAM A.** Chemical Discovery and Invention in the Twentieth Century. 487 p. 8 vo. il. 1919. \$5.00

CONTENTS: Chemical laboratories and the work done in them. Modern discoveries and theories. Modern application of chemistry. Modern progress in organic chemistry.

**TINKLER, C. K., and CHALLENGER, F.** *Chemistry of Petroleum and Its Substitutes.* 352 p. 8 vo. 1915. \$5.50

**TISDALE, C. W. WALKER.** *Butter and Cheese.* (Pitman's Common Commodities and Industries.) 142 p. il. 1920. \$1.00  
**CONTENTS:** Introductory; British dairy cattle; Milk, its production and composition; Milk analysis and distribution of constituents in butter and cheese; Bacteria. Their uses in butter and cheesemaking; Butter: Composition and properties; Purchase of milk for cream production and churning; Cream ripening and the use of starters; Churning and process of buttermaking; Churning difficulties and inferior butter; Varieties of cheese; Principles of cheesemaking; Rennet. Its preparation and use; The use of starters in cheesemaking; Cheesemaking apparatus; The process of cheesemaking; Cheddar; The ripening and yield of cheese; Marketing and judging

**TOCH, MAXIMILIAN.** *The Chemistry and Technology of Paints.* Second edition, revised and enlarged. 83 photomicrographic plates and other illustrations. 366 p. 8 vo. 1916. \$4.50

**CONTENTS:** The manufacture of mixed paints. The white pigments. The oxides of lead. The red pigments. The brown pigments. The yellow pigments. The blue pigments. The green pigments. The black pigments. The inert fillers and extenders. Mixed paints. Linseed oil. Chinese wood oil. Soya bean oil. Fish oil. Miscellaneous oils. Turpentine. Pine oil. Benzene. Turpentine substitutes. Cobalt driers. Combining mediums and water. Fine grinding. The influence of sunlight on paints and varnishes. Paint vehicles as protective agents against corrosion. The electrolytic corrosion of structural steel. Painters' hygiene. The growth of fungi on paint. Analysis of paint materials.

**TOGNOLI, E.** *Reagents and Reactions.* Translated from the Italian by C. Ainsworth Mitchell. 227 p. 16 mo. 1918. \$2.00  
 Arranged according to the names of chemists, with index by subjects. Includes tests for purity of the more important reagents

**TOLMAN, W. H., and KENDALL, L. B.** *Safety; methods for preventing occupational and other accidents and diseases* 422 p. 8 vo. 1913. \$3.00

**TORREY, J., and MANDERS, A. S.** *The Rubber Industry.* 516 p. 4 to. 1915. \$6.00

**TREADWELL, F. P., and HALL, W. T.** *Analytical Chemistry.* Translated and revised by William T. Hall, S.B., Assistant Professor of Analytical Chemistry, Massachusetts Institute of Technology. In two volumes. Vol. I—Qualitative Analysis. Fourth English edition. 538 p. 8 vo. 1915. \$4.00

A comprehensive treatise in which the fundamental principles of analysis are dealt with at considerable length. Stress is laid on the theoretical side of the subject, particularly with regard to the application of the mass action law, ionization theory, and the theory of oxidation and reduction.

Vol. II Quantitative Analysis. Fourth English edition 426 p. 8 vo. 1916. \$5.00

A complete manual giving methods for the gravimetric determination of the metals and metalloids in Part I. Part II considers volumetric analysis under the heads of acidimetry and alkalimetry, oxidation and reduction method and precipitation analyses. Part III deals with gas analyses, while two appendices contain new matter added since the volume was first put in print

**TROTMAN, S. R.** *Leather Trades Chemistry.* A practical manual on the analysis of materials and finished products. 290 p. 8 vo. il. 1918. \$5.00

**CONTENTS:** Analysis of fuel. The estimation of nitrogen. The preparation of standard solutions. Water. Effluents. Depilation. Deliming. Qualitative recognition of tannins. Analysis of tanning materials. Common vegetable tannins. Mineral tannages. Analysis of spent liquors and tans. Oils. Soap. Varnishes. Skins. Analysis of leather. Finishing and scotch. Glue. Benzene. Dyestuffs. Disinfectants and antiseptics. Glossary of technical terms used in the tanning industry. Index

**TROTMAN, S. R., and THORP, E. L.** *The Principles of Bleaching and Finishing of Cotton.* 347 p. 8 vo. il. 1911. \$6.00

**CONTENTS:** Introduction. Structure of cotton fibre. The constituents of cotton. Cotton testing. The carbohydrates. Water. Bacteria in bleaching. Cotton piece goods, introductory. Steeping. Transmission, impregnation and plating of cloth. Alkali boiling. General considerations. Materials used in lye boiling. Soap. Soap making. Organic solvents. Kiers. Washing machines. Bleaching and bleaching powder. Chinking and scouring apparatus. Sodium hypochlorite and electrolytic bleaching solutions. Other bleaching agents. Souring or treatment with acids. Processes. Colored goods. Stains and discolorations. Finishing and the materials used in finishing. Mangling, drying, conditioning. Stiffening. Auxiliary machines and processes. Stenters. Brething. Calendering. Combined finishing processes

**TOWER, OLIN FREEMAN.** *The Conductivity of Liquids: Methods, Results, Chemical Applications and Theoretical Considerations.* 82 p. 8 vo. il. 1905. \$1.50

**CONTENTS:** Units, Methods for determining conductivity. Apparatus used in determining conductivity. Sources of error with alternating currents. Calibration of bridge wire. Determination of resistance capacity. Water; Preparation of solutions; Dissociation of electrolytes; Dissociation constants. The migration of the ions; Determinations of  $\Delta^*$ ; Absolute velocity of the ions; Graphic representation of conductivity; Influence of temperature and pressure. Solutions containing two electrolytes; Applications of conductivity measurements; Conductivity of single substances; Non-aqueous solutions; Conductivity of electrolytes in mixed solvents; Appendix, conductivity tables, etc.

**TUCKER, J. H.** *A Manual of Sugar Analysis.* Including the applications in general of analytical methods to the sugar industry. Seventh edition. 353 p. 8 vo. il. 1912. \$3.50

**CONTENTS:** Chemistry of sugars as a class; Cane sugar or saccharose; Dextrose, levulose and invert sugar; Lactose or milk sugar; Determination of specific gravity; Optical and chemical methods of determining of cane sugar; Determination of dextrose and invert sugar;

Analysis of raw sugar, molasses and syrups, cane and cane juice, beet and beet juice, waste products, commercial glucose or starch sugar; Estimation of milk sugar; Estimation of dextrose in diabetic urine; The chemistry and analysis of animal charcoal.

**TUCKER, S. A.** *Beverages: a Practical and Scientific Treatise on the Manufacture of Pure Carbonated Beverages.* 63 p. 12 mo. 1920. \$100.00

**TURNER, THOMAS.** *The Metallurgy of Iron.* Fourth edition, revised. 486 p. 8 vo. il. 1916. \$6.00

This work is primarily intended for persons who are connected with the manufacture of iron and steel, and who already have some general knowledge of the subjects discussed. The history of the manufacture of iron and steel is treated more fully than is usual in metallurgical treatises. The portions dealing with foundry practice, and with the reactions of the puddling furnace, have been dealt with in detail.  
**CONTENTS:** The early history of iron. Modern history of iron. The age of steel. Chief iron ores. Preparation of iron ores. The blast furnace. The air used in the blast furnace. Reactions of the blast furnace. The gaseous products of the blast furnace. On the fuel used in the blast furnace. Slags and fluxes of iron smelting. The properties of cast iron. Foundry practice. Wrought iron. Indirect production of wrought iron. The puddling process. Further treatment of wrought iron. Corrosion of iron and steel. Index.

**TURNER, THOMAS.** *Practical Metallurgy.* Third edition. 103 p. 8 vo. il. 1908. \$1.25

A textbook intended as an introductory course for students, covering the laboratory work of the first two years, and supplying a general knowledge of the subject such as all students may be expected to require, whatever their future branch of work may be.

**CONTENTS:** Introduction. Sampling and weighing. Metals and alloys. Oxidation and reduction. Examination of fire-clay. Slags and fluxes. Examination of fuel. Iron ores. Determination of malle temperatures. Silver and silver assay. Assay of silver bullion. Assay of silver ores. Gold assay. Assay of gold ores. Properties of mercury. The microstructure of metals. Iron and steel. Electro metallurgy. Appendix. Index.

**TUTTLE, JOHN B.** *The Analysis of Rubber.* American Chemical Society Monograph. About 225 p. Ready about December 1, 1921.

**TWYFORD, H. B.** *Purchasing.* Its economical aspects and proper methods. 252 p. 8 vo. 1915. \$4.00

**CONTENTS:** Purchasing. Principles of Purchasing; General Considerations. Functional Position of Purchasing Considered. Ethics of Buying. The Purchasing Agent; The Purchasing Department. Organization of Department. System of Procedure. Obtaining and Tabulating Proper Records; Work Connected With Requisition and Order. Invoices and Method of Handling; Operation of Stores

**TWYFORD, H. B.** *Storing: its economic aspects and proper methods.* 200 p. 8 vo. il. 1918. \$3.50

**CONTENTS:** General considerations. Economic questions connected with storing. Specifications, definitions and standardizations; Location and equipment of storeroom; Appliances for use in the storeroom; Manual operations. Clerical work—Inventories, The stores department; Receiving material; Inspecting and placing material in storeroom. Deliveries from storeroom.

**UEBELE, C. L.** *Paint Making and Color Grinding.* 483 p. 8 vo. 1913. \$10.00

**UNDERWOOD, N., and SULLIVAN, T. V.** *Chemistry and Technology of Printing Inks.* 139 p. 12 mo. 1915. \$4.00

(Authors were chief and assistant chief, respectively, of the ink making division of the Bureau of Engraving and Printing, United States Treasury Department)

**CONTENTS:** Introduction. Testing of materials. Laboratory apparatus. Methods of analysis; Physical tests of pigments. Manufacture and properties of ink making materials. Reds, Blues, Yellows, Greens; Oranges, Russets, Violets, Blacks; Diluents; Bases, Oxidant, lakes, Oils. Typographic varnishes, reducers. The manufacture of printing inks. General considerations. Explanation of terms; Printing inks. Plate inks; Typographic inks; Defects of inks and their remedies.

**UPTON, GEORGE BURR.** *The Structure and Properties of the More Common Materials of Construction.* 327 p. 8 vo. il. 1916. \$3.00

Largely theoretical and based upon a laboratory course given to the juniors in Sibley College, Cornell University. The first part deals with the determination of the properties of materials by means of engineering testing, no attempt having been made to give collections of data on the results of tests, although there is an attempt to teach how to interpret and criticize results. The second part deals with the nature and control of the internal structure of materials. The principles of physical chemistry are presented simply and with helpful diagrams. Certain parts of the book are stated to be new, the details of which have not before appeared in print.  
 "The form and presentation of the subject and its analytic treatment give the book distinct value as a text."—*Engineering & Contracting*, Jan. 19, 1916, p. 73.

**VAN DER BIJL, H. J.** *The Thermionic Vacuum Tube and Its Applications.* 391 p. 8 vo. il. 1920. \$5.00

**CONTENTS:** Properties of electrons; Dislodgement of electrons from atoms of vapors and gases; Ionization; Dislodgement of electrons from solid substances; Physics of the thermionic valve; Influence of gas on the discharge; Rectification of currents by the thermionic valve; The thermionic amplifier; The vacuum tube as an oscillation generator; Modulation and detection of currents with the thermionic tube; Miscellaneous applications of the thermionic tube.

**VAN DOREN, DURAND HALSEY.** *Workmen's Compensation and Insurance.* 332 p. 8 vo. 1918. \$2.00

Problem considered in its social, economic and legal aspects. Index.

**VAN HALL, C. J. J.** *Cocoa.* 543 p. 8 vo. 1914. \$3.50

**VAN KLOOSTER, H. S.** *Physical Chemistry. Lecture Demonstrations.* 196 p. 12 mo. 1919. \$2.00

In all, 253 experiments are listed, under twelve chapters bearing the following titles: General properties of matter in the liquid and solid state. Diffusion. Osmosis. Vapor pressure and determination of molecular weights. Chemical equilibrium and the law of mass action. Catalysis. Electrochemistry and ionic theory. Solubility and its changes. Colloids and absorption. Actinometry. Flame, combustion and explosion. Liquid air experiments. A bibliography, author index and subject index are included.

**VAN SLYKE, L. L., and PUBLON, C. A.** *Science and Practice of Cheese Making.* 499 p. 12 mo. il. 1909. \$1.75

**VAN WAGENEN, THEODORE F.** *International Mining Law.* 342 p. 8 vo. 1918. \$3.50

Digests the mining laws of the various countries, giving statistics of production and history of the industry in each principal field, treating also of ancient and repealed legislation and customs, as well as of the beginnings, rise, and growth of the occupation of mining. Does not include the mining of coal, iron, and non-metallic substances.

**VEGA.** *Logarithmic Tables of Numbers and Trigonometrical Functions.* Translated from the Fortheth, or Dr. Bremker's thoroughly revised and enlarged edition, by W. L. F. Fischer. Eighty-first edition. 603 p. 8 vo. \$2.50

CONTENTS: Briggs or Common Logarithms of the Natural Numbers from 1 to 100,000; Logarithms of the Sines and Tangents from Second to Second; Logarithms of the Trigonometrical Functions from Ten to Ten Seconds; Table for the Conversion of Sidereal Time into Mean Time and Mean Time into Sidereal Time; Tables of Refraction; Constants.

**VENABLE, F. P.** *The Development of the Periodic Law.* 321 p. il. 12 mo. 1896. \$2.50

CONTENTS: Proust's hypothesis and the Doberneier triads, Dumas and the period from 1850 to 1860, The immediate forerunners of the periodic law. The announcement of the periodic law (1869-1871); Development of the systems (1870-1880); The development of the natural law (1880-1885); The development of the natural law (1885-1890); The development of the natural law (1890-1890).

**VENABLE, F. P.** *The Study of the Atom or the Foundation of Chemistry.* 290 p. 12 mo. 1904. \$2.25

CONTENTS: Ancient views as to the nature of matter, From the Greek philosophers to Dalton, The atomic theory of chemistry, The relative weights of the atoms, The periodic or natural systems, Affinity, the atomic binding force; Valence; Molecules and the constitutions of matter.

**VENABLE, F. P.** *Zirconium and Its Compounds.* American Chemical Society Monograph. About 300 p. Ready about December 15, 1921.

**VILLAVECCHIA, VITTORIO.** *Treatise on Applied Analytical Chemistry. Methods and standards for the chemical Analysis of the principal industrial and food products,* translated by Thomas H. Pope. Vol. 1. 475 p. 8 vo. il. 1918. \$6.00

"As a whole the work is extremely valuable for its full compilation of specific tests and criteria, standards and requirements for commercial purity of industrial chemical substances." *Metalurgical & Chemical Engineering*, May 1, 1918.

**VINCENT, C.** *Ammonia and Its Compounds: Their Manufacture and Uses.* Translated by M. J. Salter. 122 p. 8 vo. il. 1901. \$2.50

CONTENTS: Extraction of ammoniacal products from sewage. Extraction of ammonia from gas liquor. Manufacture of ammoniacal compounds from bones, nitrogenous waste, beetroot wash and peat. Manufacture of caustic ammonia and ammonium chloride, phosphate and carbamate; Recovery of ammonia from ammonia; Soda mother liquor.

**VOORHEES, E. BURNETT.** *Fertilizers; source, character and composition.* 365 p. 12 mo. 1916. \$1.50

**VOSMAER, A.** *Ozone, Its Manufacture, Properties and Uses.* 210 p. 8 vo. il. 1916. \$2.50

CONTENTS: Nature of ozone. Early history. Constitution. Nature, Occurrence; Properties. Tests. Manufacture of ozone. Non-electrical methods; Electrical methods. Electrolysis. Electrical discharges. In general; The brush discharge in detail; Influence of medium; Influence of electrodes; Influence of current; Influence of circuit; Influence of radiations, magnetic, and electric fields; Influence of dielectric; Theory; Ozonators; Non-dielectric system; Dielectric system; Efficiency. Uses of ozone. Purification of drinking water, Purification of air; Therapeutic uses; Uses in the industries. List of American patents bearing on ozone; Bibliography.

The aim has been to produce a book thoroughly scientific and accurate as distinguished from the mass of literature pertaining to ozone that is purely commercial and intended for advertising uses. This subject, which involves so many of the sciences, is still practically in its infancy, and its possibilities may yet prove limitless.

**VULTE, HERMANN T.** *Household Chemistry for the Use of Students in Household Arts.* Third edition, revised. 243 p. 12 mo. 1919. \$1.50

CONTENTS: Introductory; Atmosphere and ventilation; Water; Metals; Glass, pottery, and porcelain; Fuels; Carbohydrates; Fruits and fruit juices; Fats; Proteins; Baking Powders; Tea, coffee, chocolate and cocoa; Ferments and preservatives; Disinfectants and disinfection; Cleansing agents; Volumetric and gravimetric analysis; Reagents; Appendix.

**VULTE, H. T., and VANDERBILT, S. B.** *Food Industries.* An elementary text-book on the production and manufacture of staple foods. By Hermann T. Vulte, Ph.D., F.C.S., Assistant Professor of Household Arts, Teachers College, Columbia University, and Sadie B. Vanderbilt, B.S., Instructor in Household Arts, Teachers College, Columbia University. Third edition. 325 p. 8 vo. il. 1920. \$3.00

CONTENTS: Introduction. Chapter I.—Food principles. Chapter II.—Water. Chapter III.—Cereals. Chapter IV.—The king of cereals.

Old milling processes. Chapter V.—Modern milling and mill products. Chapter VI.—Breakfast foods and coffee substitutes. Chapter VII.—Utilization of flour, breadmaking. Chapter VIII.—Leavening agents. Chapter IX.—Starch and allied industries. Chapter X.—The sugar industry. Chapter XI.—Fruits, vegetables and nuts. Chapter XII.—Alcoholic beverages. Chapter XIII.—Alcoholic beverages (continued). Chapter XIV.—Fats. Chapter XV.—Animal foods. Chapter XVI.—The packing house. Chapter XVII.—Milk. Chapter XVIII.—Milk products. Chapter XIX.—Preservation of foods. Chapter XX.—The canning industry. Chapter XXI.—Tea, coffee and cocoa. Chapter XXII.—Spices and condiments. Bibliography. Index.

**WADE, A. S.** *Cotton Spinning.* (Pitman's Common Commodities and Industries.) 102 p. il. 12 mo. 1921. \$1.00

CONTENTS: The world's spindles; Cotton spinning after the war; Cotton spinning mill finance; Collective bargaining. The raw cotton position; Early spinning inventions. The jenny and the water frame; The mule and the ring frame; The modern spinning mill.

**WAGNER, E.** *Recipes for the Preserving of Fruits, Vegetables and Meat.* Translated from the German. 125 p. 8 vo. il. 1908. \$2.50

CONTENTS: Preserved Fruits. Canned Fruits; Glazed and Canned Fruits; Marmalades, Jams, and Fruit Jellies; Fruit Jellies; Fruit pulp for Jams; Preserved Vegetables; Preserved Meats.

**WAGNER, FREDERICK H.** *Cleaning of Blast Furnace Gases.* 168 p. 8 vo. il. 1914. \$2.50

CONTENTS: I. Theory of condensation, or cooling. II—Primary cleaning, dry dust cleaning. III. Wet cleaning, or cooling. IV.—Final cleaning. V.—Dry system for final cleaning. VI.—Operative plants in America. VII.—The storage of gas.

**WAGNER, F. H.** *Coal and Coke.* By Frederick H. Wagner, Member American Gas Institute; Franklin Institute. 431 p. 8 vo. il. 1916. \$5.00

A complete treatise, prepared to give the student of coal gas production data in concise form covering the various systems of coal carbonization. Part I on coal covers the origin, classification, combustion, distillation, analysis, preparation and storage. Part II covers the process of coke making, the by-products derived, and full descriptions of the types of coke ovens and retorts.

CONTENTS: I.—Origin and classification of coal. II.—Oxidation and spontaneous combustion. III.—Coking and gas coals. IV.—Analyzing coal. V.—Preparation and storage of coal. VI.—Carbonization in retort benches. VII.—Combustion and the heating of settings. VIII.—Flue gases. IX.—Pyrometry. X.—Fuebers thermic reactions. XI.—Carbonization in ovens. XII.—Chamber ovens. XIII.—Low temperature carbonization. XIV.—Power production with waste heat. XV.—Coke.

**WAGNER, F. H.** *Coal Gas Residuals.* By Frederick H. Wagner, Mem. American Gas Institute; Franklin Institute. Second edition. 214 p. 8 vo. il. 1918. \$2.50

A complete treatise giving the modern methods of securing the residuals pertaining to the carbonization of coal. It contains a full discussion of the field theory and practice. It has valuable data and diagrams for gas companies and chemical manufacturers. The second edition includes much new material and a new chapter on the manufacture of sulphuric acid when spent oxide is used as a base.

CONTENTS: I.—Tar. II.—Naphthalene. III.—Cyanogen. IV.—Ammonia. V.—Benzol. VI.—Sulphuric acid. VII.—Tests.

**WAGNER, JOSEPH B.** *Seasoning of Wood.* A treatise on the natural and artificial processes employed in the preparation of lumber for manufacture with detailed explanations of its uses, characteristics and properties. 275 p. 8 vo. il. 1917. \$4.00

CONTENTS: Timber; Coniferous Trees; Broad-leaved Trees; Grain, Color, Odor, Weight and Figures in Wood; Enemies of Wood; Water in Wood; What Seasoning Is; Advantages of Seasoning; Difficulties of Drying Wood; How Wood is Seasoned; Kiln Drying of Wood; Types of Dry Kilns, Dry Kiln Specialties; Helpful Appliances in Kiln Drying.

Until quite recently very little attention has been paid to the proper seasoning of wood, other than that by keeping lumber exposed for a period of time after sawing it was then ready (seasoned) for use. Recently, however, wood users have become much interested in the operations of kiln drying and its advantages, so that the need for a practical treatise on technical features of this process is keenly felt. Mr. Wagner's book contains the results of many years of practical working with lumber, and is based on a close study of the different species of wood under varying mechanical temperatures and under different drying processes.

**WAHL, A.** *The Manufacture of Organic Dyestuffs.* Authorized translation with additions from the French of André Wahl, D. & Sc., Professor of Industrial Chemistry in the University of Nancy, by F. W. Atack, M.Sc.Tech., B.Sc., A.I.C., Demonstrator in the Chemical Laboratories of the School of Technology, University of Manchester. 338 p. 12 mo. 1914. \$2.00

**WALLIS-TAYLER, A. J.** *The Preservation of Wood; a descriptive treatise on the processes and on the mechanical appliances used for the preservation of wood.* 344 p. 8 vo. il. 1917. \$4.00

Brings together a large amount of practical, well illustrated information on wood decay, seasoning, details of various preserving methods, absorption limit and life of preserved woods, fireproofing, and costs, with an appendix containing useful formulae, tables, memoranda, etc.

**WALLIS-TAYLER, A. J.** *Sugar Machinery.* A descriptive treatise devoted to the machinery and apparatus used in the manufacture of cane and beet sugar. Second edition, revised and enlarged. 390 p. 12 mo. il. 1912. \$3.00

CONTENTS: Complete factories; Extraction of the juice from the raw material, Raising or pumping and weighing the juice or liquor; Heating and clarification or defecation of the juice or liquor; Mechanical purification of the liquor; Evaporation, concentration, and granulation under atmospheric pressure and in vacuo; Evaporation and concentration in vacuo; Curing or extracting the molasses from the sugar; Extraction of the waste sugar from the molasses; Formation of crystals.

from sugar solutions; Treatment of saccharine liquids by electricity; Tests; Transport of canes; Repairs and renewals; Specimen forms for use in sugar factories; Useful tables, memoranda, etc.; Technology of sucrose.

**WALSH, JOSEPH J.** *Physics and Chemistry of Mining and Mine Ventilation.* A practical handbook for vocational schools, and for those qualifying for mine foreman and mine inspector certificates. By Joseph J. Walsh, Mine Inspector, Wilkes-Barre, Pa. Second edition, revised and enlarged. 229 p. 8 vo. il. 1918. \$2.50

All the general features contained in the first edition which students and others interested in the physics and chemistry of mining and mine ventilation commended have been retained in this revised edition. The chapters dealing with gases and mine ventilation have undergone revision and new material added. The chapter treating of the new sampling and analysis of mine gases is new, and has been written to supply a need which has arisen in teaching gas analysis, and also to meet the growing demand for a more thorough knowledge of this branch of mining. In this chapter mine gases are treated in a more practical way than is the custom in ordinary books on the subject. The properties of gases and the changes which affect their composition, together with the products of the combustion of gases, are clearly defined.

**WALTER, ERICH.** *Manual for the Essence Industry.* 427 p. 8 vo. 1916. \$4.00

CONTENTS: Flavoring and its transfer to foods and beverages. Raw materials yielding the different tastes, laboratory practice. Non-alcoholic beverages. Mineral waters, fruit juices and essences for effervescent lemonades, jams and fruit wines. Essences for confectionery, baking and the kitchen. Coloring matters for foods and drinks. Cosmetic essences (perfumery, cosmetics and soap perfumes).

**WANG, CHANG YU.** *Antimony.* 217 p. 8 vo. il. 1909. \$5.00

CONTENTS: The history of antimony. The chemistry of antimony. The mineralogy of antimony. The geological occurrence of antimony ores. The metallurgy of antimony. The antimony preparations and their uses. The analysis of antimony compounds. The production and valuation of antimony ore. The principal mines and smelting works of antimony. Index.

**WANG, CHANG YU.** *Bibliography of the Mineral Wealth and Geology of China.* 61 p. 12 mo. 1917. \$1.25

CONTENTS: Minerals (including mining and metallurgy), coal, iron, gold and silver; Minerals in general, Mining industry in general. Geology. General petrology, paleontology.

**WANKLYN, J. A.** *Water Analysis.* A practical treatise on the examination of potable water. Eleventh edition. Revised by W. J. Cooper. 240 p. 12 mo. il. 1907. \$2.00

**WANKLYN, J. ALFRED, and COOPER, WILLIAM JOHN.** *Sewage Analysis.* A practical treatise on the examination of sewage and effluents from sewage. Including also a chapter on utilization and purification. 220 p. 12 mo. il. 1899. \$2.00

CONTENTS: Introduction. The specific gravity of sewage and sewage effluents. Chlorine. Sulphates in sewage and sewage effluents. The carbonic acid in sewage and sewage effluents. The ammonia method of sewage analysis. Free and albuminoid ammonia. The most common process applied to sewage and sewage effluents. The total solid residue, its amount and examination. General statement of analytical results. The utilization and purification of sewage.

Appendix. Chemistry of manganate. On the action of permanganate of potash on urea, ammonia, and acetamide in strongly alkaline solution. Water analysis: Determination of cellulose and modified cellulose in drinking water. Action of alkaline solutions of permanganate of potash on certain gases. The most common processes. Some reactions of alkaline permanganate of potash. Products of the oxidation of wool-cyano-propionic acid. Notes on hydrogen gas. Nature of solutions as to density of specific gravity. On magnesium. On a proposed method of preventing the fermentation in sewage and the formation of sewer gases. Social science congress, health department. On the comparative effect of lime and other chemicals upon sewage. Index.

**WARE, L. S.** *Beet-Sugar Manufacture and Refining.* By Lewis S. Ware, Editor "The Sugar Beet." Vol. I. Permanently out of print. Vol. II. Evaporation, Graining, and Factory Control. 647 p. 8 vo. il. 1905. \$5.00

CONTENTS: Part IV—Evaporation. Evaporators. Multiple effects. Condensation. Multiple reheating. Perturbations. Calculations. Part V. Manufacture of raw sugar. Graining. Preparing masscotte. Curing. Transportation and storage. Part VI. Working after products. Evaporation and return of after-products into the juices. Graining pans and crystallizers. Curing. Part VII. Manufacture of white sugar. Granulated sugar. Loaf sugar. Cakes and bars. Sawing, crushing and breaking sugar. After-products and refining losses. Part VIII—Utilization of residues. Extraction of sugar from molasses. Flutun. Substitution and separation. Desugarization of molasses. Part IX—Steam economy. Part X.—Practical working of a beet sugar factory.

**WARNES, A. R.** *Coal-tar and Some of Its Products.* (Pittman's Common Commodities and Industries.) 105 p. il. 1919. \$1.00

CONTENTS: Coal-tar and its manufacture; Prepared tar; Tar for roofing felt; Yield of distillates from tar; Destructive distillation of coal-tar; Pitch and its uses; Creosote oil and its uses; Naphthalene and its uses; Anthracene oil; Ammoniacal liquor and the manufacture of some compounds of ammonia; Working up of crude naphtha and light oil; Chemical treatment of once-run benzol, Once-run naphtha and once-run heavy naphtha; Manufacture of benzols and naphthas; Manufacture of commercially pure benzene and toluene, and some of their uses; Manufacture of pyridine bases; Manufacture of carbolic and cresylic acids, and some of their uses.

**WARNES, ARTHUR R.** *Coal-tar Distillation and Working Up of Tar Products.* Second edition, revised and enlarged. 315 p. 8 vo. il. 1914. \$5.00

CONTENTS: Coal-tar composition; Effect of nature of raw material and heat of carbonization on physical properties and chemical

composition of tar; Results of practical distillations; Coal-tar; Vertical retort tar; Increasing solubility in tar; "Free carbon" of tar; How tar is received from gas works; Tar type; Storage of tar; Construction of storage tanks. Pumps; Tar mains; Plants used in the distillation of tar; Distillation of coal tar; Plant for and recovery of cresylic and carbolic acids from coal tar; Plant for and the recovery of benzol; Naphtha, etc.; First distillation and washing; Rectification of benzols and naphthas; Plant for the working up of pyridine from pyridine-acid; Recovery and rectification of pyridine bases; Plant for, and the manufacture of, crude naphthalene and anthracene; Pitch and pitch "getting"; Creosote; Gas stripping; Tarworks' tests; Appendix.

In the second, revised and enlarged edition many additions have been made to the majority of the old chapters, some new diagrams have been inserted, and the subjects of continuous dehydration and distillation have received some attention. On account of its importance and its close connection with the coal tar industry, an entirely new chapter on the subject of gas stripping is given.

**WASHBURN, E. W.** *Introduction to the Principles of Physical Chemistry; from the standpoint of modern atomistics and thermodynamics.* 445 p. 8 vo. 1915. \$4.00

CONTENTS: I.—The structure of matter and the composition of substances. II.—The gaseous state of aggregation. III.—The liquid state of aggregation. IV.—Liquid gas systems. V.—The crystalline state of aggregation. VI.—Crystal gas systems. VII.—Crystal liquid systems. VIII.—Relations between physical properties and chemical constitution. IX.—The Brownian movement and molecular motion. X.—Some principles relating to energy. XI.—Solutions I: Definition of terms and classification of solutions. XII.—Solutions II: The colligative properties of solutions and the thermodynamic relations which connect them. XIII.—Solutions III: Thermodynamic environment. Ideal solutions and dilute solutions. XIV.—Solutions IV: The laws of solutions of constant thermodynamic environment. XV.—The colligative properties of solutions of electrolytes. XVI.—The conduction of electricity. XVII.—Conductance and degree of ionization. XVIII.—Electrical transference. XIX.—Thermochemistry. XX.—The heat capacity and internal energy of material systems. XXI.—Chemical kinetics. XXII.—Chemical equilibrium. XXIII.—Chemical equilibria involving the ions of water. XXIV.—The phase rule. XXV.—Disperse systems. XXVI.—Radioactivity. XXVII.—Atomic structure and the periodic system. Appendix—Thermodynamic derivations.

**WASHINGTON, HENRY S.** *Manual of the Chemical Analysis of Rocks.* Third edition, revised and enlarged. 271 p. 8 vo. il. 1919. \$2.50

CONTENTS: Introduction. Apparatus and reagents. The sample. Operations. Methods. Appendixes. Index.

**WATSON, E. S.** *Color in Relation to Chemical Constitution.* 107 p. 8 vo. il. 1918. \$4.50

CONTENTS: Early history. Discussion of the quinonoid theory. Absorption spectra. Relationships between constitution and depth of color. Theories on the nature of the vibrations causing absorption bands and color. Infrared absorption spectra. Fluorescence. Color and spectra of inorganic compounds. Bibliography. Index.

**WATT, A.** *The Art of Paper-making.* A practical handbook of the manufacture of paper from rags, esparto, straw, and other fibrous materials, including the manufacture of pulp from wood fiber. Third edition. 260 p. 8 vo. il. 1908. \$4.00

CONTENTS: Cellulose. Materials used in Paper-making; Treatment of Rags; Treatment of Esparto; Treatment of Wood; Treatment of Various Fibers. Bleaching; Beating or Refining. Loading. Sizing; Coloring; Making Paper by Hand, Making Paper by Machinery. Calendering. Cutting and Finishing. Colored Papers, Miscellaneous Papers; Machinery Used in Papermaking. Recovery of Soda from Spent Liquors. Determining the Real Value or Percentage of Commercial Sodas. Chloride of Lime, etc.; Useful Notes and Tables.

**WATT, A.** *Electroplating and Electro Refining of Metals.* Being a new edition of Alexander Watts' "Electro-Deposition." Revised and largely rewritten by Arnold Philip. Second edition, revised. 704 p. 12 mo. 1902. \$5.00

CONTENTS: Batteries. Thermopiles. Cost of electrical installations for small output for electroplating. Electrodeposition of copper. Deposition of gold by simple immersion. Electrodeposition of gold and silver; Various gilding operations. Imitation antique silver; Electrodeposition of nickel, tin, iron, zinc and other metals and alloys; Recovery of gold and silver waste from waste solutions. Mechanical operations involved in electrodeposition. Materials used; Electroplating.

**WATT, HOMER ANDREW.** *The Composition of Technical Papers.* 431 p. 12 mo. 1917. \$1.75

A textbook which aims to teach engineering students to write better technical papers. It is the "result of a teaching experience of several years at the University of Wisconsin, and embodies the methods employed there in a one semester, three-hour course elective for juniors and seniors in the College of Engineering."

**WATTS.** *Dictionary of Chemistry.* Revised and entirely rewritten by M. M. Pattison Muir, M.A., F.R.S.E., Gonville and Caius College, Cambridge; and H. Forster Morley, M.A., D.Sc., Professor of Chemistry, University College, London; assisted by eminent contributors. Complete in four volumes. 8 vo. 1911-1914. \$50.00. Separately as follows:

Vol. I. (A-Ch). 772 p. \$14.50  
Vol. II. (Ch-In). 772 p. \$14.50  
Vol. III. (In-Ph). 868 p. \$16.00  
Vol. IV. (Ph-Z). With addenda. 934 p. \$20.00

**WEAVER, E. M.** *Notes on Military Explosives.* Fourth edition. 382 p. 8 vo. 1917. \$3.75

Describes the substances used in the manufacture of explosives, and the processes of manufacture of the various military explosives; explosives; tests, handling and storage of explosives. Sections on laboratory experiments and regulations for transportation of explosives are appended.

Author is Major General, U. S. Army; Chief of Coast Artillery.

**WEBBER, EDUARDO.** *Technical Dictionary.* English, French, Italian, German arranged in parallel columns. 921 p. 16 mo. 1918. \$5.00



**WEBBER, W. H. Y.** Gas and Gas-Making. (Pitman's Common Commodities and Industries.) 130 p. il. 12 mo. 1919. \$1.00

**CONTENTS:** The nature and origin of the gas industry; Gas supply as a public service undertaking; Early methods of gas making; Gas manufacture; The middle period; Gas manufacture; Later practice; Modern carbonizing standards; Gasworks' plant; Gas transmission and distribution; Gas distribution (continued); Gas measurement and regulation; General uses of gas; Gas as fuel; Fuel applications of gas; Gas lighting by incandescence; Cooking by gas; Water heating by gas; Gas fires; The industrial uses of gas; Speculation as to the future; Hints for gas consumers.

**WEBER, CARL OTTO.** The Chemistry of India Rubber. New edition. 314 p. 8 vo. il. 1919. \$6.00

**CONTENTS:** The chemistry of India rubber; Examination and valuation of gutta percha and India rubber; Examination of India rubber substitutes; Inorganic compounding materials; Vulcanizers and sulphur carriers; India rubber solvents; Coloring matters; Constructive components of India rubber articles; Analysis of rubber articles; Appendix—Sanitary conditions in India rubber works; Index.

**WEED, WALTER HARVEY.** The Mines Handbook; an enlargement of the Copper Handbook founded by Horace J. Stevens. 1900. v. 13. 1918. 1896 p. 8 vo. Maps \$10.00

The well known Copper Handbook has now become a most excellent directory of all the metal mines. Prominent changes noted are the geographical arrangement of companies (with alphabetical index) and compact maps of the mining districts. Foreign mines are included, and the information regarding Japanese mines is stated to be especially noteworthy.

**WEGMANN, E.** Conveyance and Distribution of Water for Water-supply; aqueducts, pipe lines, and distributing systems. 663 p. 8 vo. il. 1918. \$5.00

Aims to treat with "sufficient detail to be of practical value" such subjects as water distribution, the detection and prevention of waste by means of Pitot tube gaugings and water meters, fire protection, high pressure water systems, tipping machines, valve inserting machines, water stage recorder and other devices and appliances. Leading types of apparatus are described, and chapter on submerged pipes is especially noteworthy. Well illustrated and supplied with useful tables and specifications. The author served for thirty years as engineer in connection with the construction and maintenance of New York City's water supply.

**WEISS, H. F.** Preservation of Structural Timber. Second edition. 361 p. 8 vo. 1920. \$3.50

**CONTENTS:** I. Introduction. II. Factors which cause the deterioration of structural timber. III—Effect of the structure of wood upon its preservation. IV—Preparation of timber for its preservative treatment. V—Processes used in protecting wood from decay. VI—Preservatives used in protecting wood from decay. VII—Construction and operation of wood preserving plants. VIII—Prolonging the life of cross arms from decay and abrasion. IX—Prolonging the life of poles and cross arms from decay and insects. X—Prolonging the life of fence posts from decay. XI—Prolonging the life of piling and boats from decay and marine borers. XII—Prolonging the life of mine timbers. XIII—Prolonging the life of paving blocks. XIV—Prolonging the life of shingles. XV—Prolonging the life of lumber and logs. XVI—Protection of timber from fire. XVII—Protection of wood from minor destructive agents. XVIII—Strength and electrolysis of treated timber. XIX—Use of substitutes for treated timber. XX—Appendices.

**WELLS, HORACE L.** Chemical Calculation Tables. 41 p. 8 vo. 1919. \$1.35

A revision and modification of the author's "Tables for Chemical Calculations," which is now out of print. A new table for facilitating the calculation of percentage compositions of organic compounds has been added, while several of the smaller, less important, tables have been omitted, with a view to making the book more compact and more convenient for its chief use.

The table of logarithms of numbers has been "double thumb indexed," making it easy to turn from any place in the table to any other reference, backward as well as forward, all indices being visible from every part of the table.

In addition to making the work of calculation more rapid and less laborious than is often the case, these tables will be of assistance in avoiding errors.

**CHAPTERS:** Atomic weights. Gravimetric factors. Formula weights. Indirect analysis. Reduction of gas volumes to 0° and 760 mm. Calculation of percentage of nitrogen from the gas volume. Barometer corrections for temperature. Multiples for organic compounds. Constants for molecular weight determinations. Weights and measures. Logarithms of numbers.

**WELLS, H. L.** Textbook of Chemical Arithmetic. By Professor Horace L. Wells, M.A. 169 p. 12 mo. 1912. \$1.50

A book designed for students of quantitative analysis. It comprises problems in weights as related to gravimetric analyses, calculations relating to gases and calculations relating to volumetric analyses.

**SUMMARY OF CONTENTS:** Part I—APPROXIMATE NUMBERS. Apparent errors, accidental errors. The multiplication and division of approximate numbers, abbreviated multiplication errors in the use of logarithms. Operations with logarithms, etc. Part II—CALCULATIONS RELATING TO WEIGHTS. Relative atomic weights, atomic weights compared with a basis. The calculation of indirect analyses in more complex cases. Calculation of formulas from analyses in cases of complex cases. Calculation of formulas from analyses in cases of complex cases. Calculation of formulas from analyses in cases of complex cases.

Calculation of formulas in connection with molecular weights, etc. Part III—CALCULATIONS RELATING TO GASES. The weights of gases under varying conditions. Densities and molecular weights of gases. The relation of weights and volumes in terms of English weights and measures. The correction of barometers for temperature, etc. Part IV—CALCULATIONS RELATING TO VOLUMETRIC ANALYSIS. Standardization of volumetric solutions. Simple factor solutions. Errors in volumetric processes, etc. Appendix—Answers to problems. Atomic weights; International table. Atomic weights of commoner elements and some of their multiples, with logarithms. Some multiples of atomic weights and group weights, etc.

**WESTCOTT, HENRY P.** Handbook of Casinghead Gas. Second edition. 577 p. 12 mo. il. 1918. \$3.50

**WESTCOTT, HENRY P.** Handbook of Natural Gas. Third edition. 750 p. 12 mo. 1920. Cloth \$3.75 Leather \$4.50

**WESTCOTT, HENRY P.** Measurement of Gas by Orifice Meter. 408 p. 8 vo. il. 1918. \$3.50

**CONTENTS:** General; Measuring gas by orifice meter or Pitot tube; Orifices; Capacity; Encased spring type differential gauge; Installing; To check differential gauge; Coefficients; Correcting coefficients; Charts; Pressure extensions; Miscellaneous; Index.

**WHEELER, H. J.** Manures and Fertilizers. 189 p. 12 mo. 1913. \$2.40

**WHEELER, GEORGE.** American Gas Works Practice. Standard, practical methods in gas fitting, distribution and works management. 741 p. il. 1919. \$4.00

**CONTENTS:** History and progress; Gases and their properties; Manufacturing methods; Distribution suggestions; Labor saving in the gas industry; Utilization of gas; Employees; Management; The fitting shop; Connecting appliances; House piping; Consumers' meters; Meter repairs and tests; Street department mains; Services and records; Acetylene welding; Store room and fitting rules; Gas company rules.

**WHITBY, G. STAFFORD.** Plantation Rubber and the Testing of Rubber. (Monographs on Industrial Chemistry.) 559 p. 8 vo. il. 1920. \$6.50

**CONTENTS:** Part I The preparation of plantation rubber; The rubber tree and the extraction of latex; Latex and its coagulation; The resin, the protein, collection of latex; Coagulation in the factory; Crepe; Sheet; Maturating; Variation. Part II The Testing of Rubber. The stress-strain relations of rubber; The modulus of elasticity; Technique of tensile tests; Technique of vulcanization testing; Properties changes on vulcanization; Comparison of raw rubber samples; Stability of state of cure; Technical mixes; Viscosity determinations; Cycles of extension and retraction; Hysteresis; Elastic after effect; Relation of the terminal optical and electrical to the mechanical behavior of rubber; Poisson's ratio; Bibliography; Index.

**WHITE, ALFRED H.** Technical Gas and Fuel Analysis. Second edition, revised and enlarged. 319 p. 8 vo. 59 il. 1920. \$3.00

A completely revised and greatly enlarged edition of this standard reference and textbook, describing standard apparatus and presenting a concise statement of principles and full details of methods.

**CONTENTS:** I. Sampling and storage of gases. II. General methods of technical gas analysis. III. Absorption methods for carbon dioxide, unsaturated hydrocarbons, oxygen, carbon monoxide and hydrogen. IV. Explosion and combustion methods for hydrogen, methane, ethane and carbon monoxide. V. Various types of apparatus for technical gas analysis. VI. Exact gas analysis. VII. Heating value of gas. VIII. Candle power of illuminating gas. IX. Estimation of suspended particles in gas. X. Chimney gas. XI. Producer gas. XII. Illuminating gas and natural gas. XIII. Liquid fuels. XIV. Sampling coal. XV. The chemical analysis of coal. XVI. Heating value of coal by the bomb calorimeter. XVII. Heating value of coal by the Parr calorimeter and other methods. Appendix. Tables.

**WHITE, BENJAMIN.** Gold: Its Place in the Economy of Mankind. (Pitman's Common Commodities and Industries.) 130 p. 12 mo. il. 1920. \$1.00

**CONTENTS:** Its appreciation Ancient and modern; Its properties and distribution; The production of early times; The production of the nineteenth century; Present production and prospects; The evolution of British coinage; The mintage of the world; The gold standard; The movements of gold; Stocks; Industrial use; Gold and the great war.

**WHITE, BENJAMIN.** Silver. (Pitman's Common Commodities and Industries.) 126 p. 12 mo. il. 1920. \$1.00

**CONTENTS:** Part I Production. Geological surroundings and world production; Early mints; Modern mints; Extraction from ore; Marketing. Part II Industrial Consumption. Art in silver; Manufacture; Indian industries; The evolution of British coinage. Part III Utility as Money; Past and Future. Indian currency; Chinese monetary problems; The place of silver in currency; The present position and future prospect of silver as money.

**WHITE, C. H.** Methods in Metallurgical Analysis. By Charles H. White, Prof. of Mining and Metallurgy in Harvard University. 364 p. 12 mo. 1915. \$3.00

The book is a compilation of methods which are used in American metallurgical laboratories. An excellent handbook for the commercial analyst as well as for the student.

**CONTENTS:** Definition of the subjects; Sampling; Necessity for correct sampling; The operations of analysis; Gravimetric, volumetric analysis; Colorimetry; Methods of analysis in the metallurgy of iron and steel; Moisture, Hygroscopic water, Combined water; Loss on ignition; Iron in ores; Silica, sulphur, phosphorus, alumina, manganese, lime, magnesia and titanium in ore; Analysis of iron and steel; Iron slags; Limestone; Methods of analysis in the metallurgy of copper, lead, etc.; copper, lead, zinc and arsenic in ore; Analysis of copper matte; Chilled blast furnace slags; Reverberatory slags; Briquettes and other copper-bearing products; Copper bullion; Alloys; Methods of analysis in the production of the precious metals; Fine assaying of gold and silver ores; Assay of bullion, gold and silver in cyanide solution; Testing cyanide solution; Weight of ore in sludge; The platinum metal; Analysis of fluxes; Analysis of fuels; analysis of clay; Methods for the determination of some of the minor metals; methods for the determination of some of the rarer metals; Testing of lubricating oils; Examination of boiler water; Detection of the metals; Tables; General reference.

**WHITMORE, FRANK C.** Organic Compounds of Mercury. American Chemical Society Monograph. 395 p. 8 vo. July, 1921. \$4.50

**CONTENTS:** Historical outline; General methods of preparing organic mercury compounds; General properties and reactions of organic mercury compounds; Alkyl mercury compounds; Mercury compounds obtained from olefines and acetylenes; Mercury compounds from saturated and unsaturated alcohols; Mercury derivatives of fatty acids and related compounds; Mercury derivatives of aldehydes, ketones, amides and related compounds; Mercury derivatives of aromatic hydrocarbons and nitro compounds; Mercury derivatives of aromatic amines; Mercury derivatives of phenols, naphthols, and related compounds; Mercury derivatives of aromatic acids; Mercury derivatives of aromatic

ketones, terpenes and related compounds; Mercury derivatives of heterocyclic compounds. Also compounds and aromatic azosulfoxides; Analysis of organic mercury compounds; List of proprietary mercurials; Bibliography of biological and pharmacological work with organic mercury compounds; Supplementary bibliographical lists; Lists of patents dealing with organic mercury compounds; Index.

**WHITTAKER, C. M.** Application of the Coal-tar Dyestuffs: The principles involved and the methods employed. 225 p. 8 vo. 1918. \$3.00

This book has been written with a view to giving the reader a firm grasp of the chemical principles involved, and the methods used in the application of the coal-tar dyestuffs, so that when he commences to carry out dyeing under actual commercial conditions he will know the why and the wherefore of the methods employed.

CONTENTS: General Survey of Dyeing; The Varied Uses of the Basic Dyestuffs; The Application of the Acid Dyestuffs; The Turkey-Red Industry, and Other Uses of the Alizarine Dyestuffs; The Application of the Direct Cotton Dyestuffs, Including Those Which Develop on the Fiber; The Azocoloring Matters and Their Special Use in Dyeing; The Properties of the Rosaniline Dyestuffs; The Application of the Sulphur Dyestuffs; The Application of the Vat Dyestuffs; The Dyeing of Union Materials, Including Garments; Colors Produced on the Fiber by the Oxidation of Coal-tar Products; Other Uses of Coal-tar Dyestuffs Still in Use; The Valuation and Detection of Dyestuffs.

**WHITTAKER, C. M.** Dyeing with Coal-tar Dyestuffs. 214 p. 8 vo. 1919. \$3.00

**WHYMPER, R.** Cacao and Chocolate: Their chemistry and manufacture. Second edition, revised and enlarged. 568 p. Large 8 vo. 1921. \$10.00

CONTENTS: History, botany, and agriculture of cacao. Manufacture of chocolates and cacao powders. Chemistry of cacao. Bibliography. Index.

**WIARD, E. S.** Theory and Practice of Ore Dressing. 446 p. 8 vo. 1915. \$4.00

CHAPTER HEADINGS: I.—Preliminary considerations relating to installation of ore-dressing plants. II.—Testing concentrating ores. III.—Location of mills. IV.—Crushing plant. V.—Separating plant. VI.—General discussion on crushing. Heavy crushing machinery. VII.—Rolls and medium crushers. VIII.—Means for raising ore or water. IX.—Grading and grading devices according to diameter and volume. X.—Separation of concentration proper, coarse concentration. XI.—Preparation for sand and slime concentration. Sand and slime concentration. XII.—Miscellaneous processes of sand and slime concentration.

**WIECHMANN, FERDINAND G.** Sugar Analysis. For cane-sugar and beet-sugar houses, refineries and experimental stations, and as a handbook of instruction in school of chemical technology. Third edition, rewritten. 321 p. 12 mo. 1914. \$5.00

CONTENTS: Instruments used in sugar laboratories; Polariscopes and accessories; Sucrose determination of optical and chemical analysis; Sucrose determination by optical and chemical; Constituents of sugar other than sucrose; Materials used in the sugar industries; Analytical control in cane-sugar and beet-sugar manufacture; Analytical control in refineries; Resume of the work of the International Commission for uniform methods of sugar analysis.

**WILEY, HARVEY W.** Foods and Their Adulteration; origin, manufacture and composition of food products, infants' and invalids' foods; detection of common adulterations. Third edition, revised. 646 p. 8 vo. il. 1917. \$4.00

**WILEY, H. W.** Principles and Practice of Agricultural Analysis. A manual for the study of soils, fertilizers, and agricultural products. For the use of analysts, teachers, and students of agricultural chemistry. Second edition, revised and enlarged. 3 vols. 8 vo. 1914.

Vol. I. Soils. \$4.00  
Vol. II. Fertilizers and Insecticides \$4.50  
Vol. III. Agricultural Products. \$6.00

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**WILLIAMS, H.** Mechanical Refrigeration. A practical introduction to the study of cold storage, ice making and other purposes. By Hal. Williams, A.M.I.E.E. 406 p. 12 mo. 1917. \$4.25

**WILLIAMS, H. E.** Chemistry of Cyanogen Compounds; their manufacture and estimation. 423 p. 8 vo. 1915. \$3.50

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**WILLOWS, R. S., and HATSCHEK, E.** Surface Tension and Surface Energy, their influence on chemical phenomena. Second edition. 80 p. 12 mo. il. 1919. \$1.50

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**WILSON, F. J., and HEILBRON, I. M.** Chemical Theory and Calculations. An elementary textbook. 145 p. 12 mo. il. 1913. \$1.75

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**WILSON, H. MACLEAN, and CALVERT, H. T.** A Text-book on Trade Waste Waters. Their nature and disposal. 340 p. 8 vo. il. 1913. \$6.00

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**WILSON, JOHN ARTHUR.** The Chemistry of Leather Manufacture. American Chemical Society Monograph. About 450 p. Ready about March, 1922.

**WILSON, L. C.** Corrosion of Iron; a summary of causes and preventive measures. 178 p. 12 mo. il. 1915. \$2.00

CONTENTS: The rust problem; Theories of corrosion; Protective measures; Paint materials; Protective paints; Influence of different elements on corrosion of iron; Corrosion of wrought iron and steel pipe.

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**WITHAM, G. S., Sr.** Modern Pulp and Paper Making. 509 p. 8 vo. Over 240 illustrations. 1920. (Published by The Chemical Catalog Company, Inc.)  
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This volume is the first treatise published giving in the most complete detail a description of the best American practice in the manufacture of paper. It is written by the manager of one of the largest corporations in the world engaged in the manufacture of paper and pulp. Each piece of equipment is described in detail. Minute instructions are given for operating every machine. There are more than 240 illustrations from actual photographs, with charts and diagrams. A complete practical treatise on the manufacture of pulp and paper from the saw-mill to the finishing room.

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**WOOD, H. C., REMINGTON, JOSEPH P., and SADTLER, SAMUEL P.,** assisted by A. B. Lyons, and H. C. Wood, Jr. United States Dispensatory. Twentieth edition. 2072 p. 4 to. 1918. \$12.00

Revised and largely rewritten, on the basis of the new United States Pharmacopoeia and the last edition of the British Pharmacopoeia. Includes the Pure Food and Drugs Act decisions.



**WOOD, JOSEPH R.** Tablet Manufacture. Its history, pharmacy, and practice. 224 p. 12 mo. il. 1904. \$2.00

CONTENTS: History—Compressed tablets. Moulded tablets. Introduction—General considerations. Triturating—Apparatus: Mortars and pestles, powder mixers, ball and pebble mills, chasers. Methods of triturating. Mixing, granulating, and drying—Apparatus: Mass mixers, spiral blade and spatula-blade grinding mill, sieve & drying closets. List of substances requiring no granulation. Excipients and their applications. Moistening agents. Adhesives. Bases. Disintegrator. Absorbents. Treatment of various classes of medicaments: Chemicals. Drugs. Pharmaceutical preparations. Volatile substances. Effervescent tablets. Lubricating—Sticking. Picking. Oil. Talcum. Boric acid. Compressing-tablet-machines: Setting up, care of. Punches and dies: Care of, difficulties and remedies, choice of size. Regulation of weight. Variation in weight. Causes and remedies. Regulation of pressure. Capping: Causes and remedies. Picking and sticking: Causes and remedies. Dust and shavings: Utilization. Coloring—Vegetable colors. List of colors permitted. Forbidden methods of coloring. Construction of formulas—Systems of weight. Triturate tablets. General formula. Illustrations of typical formulas. Compressed tablets proper. Illustrations of typical formulas. Lozenges. Treatment of individual substances. Detailed methods of treatment of the principal medicaments used in compressed tablets. Formulae.

**WOOD, R. A.** The Waterbury Book of Alloys. By R. A. Wood. Loose-leaf. 244 p. 8 vo. 1915. \$8.00

CONTENTS: Brass rolling mill alloys; U. S. Government specifications for non-ferrous alloys; U. S. Government standard alloys, Aluminum bronze; Anodes; Scaling dips, Brass brazing solder, Dipping metal; Braze brass tubing; Braze tube notes, Common brass, Drawn brass; Extruded metal, Flux; Furnace linings; Impurities in brass intended for rolling, Jewellers' composition bars or platers metal, Lamp burners; Effect of mercury upon the copper alloys, Molds for casting pure nickel; Commercial nickel; Blow holes and spurs; Replating silver-plated articles; Sign brass sheet; Use of strainer when pouring metal into iron molds; Silvering paste; Temperature of metal as determined by the eye; Tempered copper; Manufacture of zinc, Chain bronze.

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CONTENTS: Introduction; Definition of cordage and sources of fibers; Classification of fibers, The cultivation of hemp; Retting, breaking and cutting. The cultivation of plants for hard fibers. The preparing and spinning machinery for hemp and other soft fibers; The preparing and spinning machinery for manila and other hard fibers; Twines, cords and lines; Ropes and rope making; Yarn numbering, Marketing

**WOODHOUSE, T., and KILGOUR, P.** The Jute Industry. (Pitman's Common Commodities and Industries.) 130 p. il. 12 mo. 1921. \$1.00

CONTENTS: Introduction; Cultivation; Retting; Sorting and baling jute fiber; Mill operations; Batching; Carding; Drawing and drawing tables, The roving frame; Spinning; Twisting and reeling; Winding, Rolls and cops, Winding, beaming and dressing, Tying on, drawing in and weaving; Finishing.

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**WORDEN, EDWARD C.** Nitrocellulose Industry. A compendium of the history, chemistry, manufacture, commercial application, and analysis of the nitrates, acetates, and xanthates of cellulose as applied to the peaceful arts, with a chapter on gun cotton, smokeless powder, and explosive nitrates. Two volumes. 324 p. 8 vo. 1911. \$10.00

CONTENTS: Cellulose. The cellulose nitrates (theory). Nitration of cellulose (practice). Cellulose nitrate solvents and non-solvents. Fuel oil, natural and synthetic. Amyl alcohols. Manufacture and properties of amyl acetate. Natural, artificial, synthetic camphor. Camphor substitutes. Paint removers. Turpentine substitutes. Pyroxylin solutions. Pyroxylin lacquers. Bronzing liquids. Water-proofing compositions. Artificial leather, fur, skin, feathers, rubber. Pyroxylin-coated leather and splits. Patent and enameled leather. Celluloid, pyralin, xylonite, viscoloid. Pyroxylin plastics. Celluloid and cellulose nitrates in microscopy. Collodion and photography. Artificial silk, whalbone, gorse, horsehair. The cellulose acetates. Gun-cotton silk, whalbone, gorse, horsehair. The cellulose acetates. Gun-cotton and the explosive cellulose nitrates. Viscose, viscoloid, and the cellulose xanthates. Denatured ethyl alcohol. Patent, author, and subject index.

The most complete and comprehensive work on the general technology of nitro-cellulose ever issued in any language, and adequately covers the entire field in detail. It contains over 8000 patent and literature references of over 2000 different investigators, representing the work of everyone in the field from the earliest days to the present.

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**Carbohydrate Carboxylates (Cellulose Acetate), being Vol. VIII. Illustrated. 1916. \$5.00**

**WRAIGHT, E. A.** Assaying in Theory and Practice. 383 p. 8 vo. 1914. \$3.00

**WRÉN, HENRY.** The Organometallic Compounds of Zinc and Magnesium. 100 p. 12 mo. 1913. \$1.00

CONTENTS: General notes on Grignard's reaction; Products formed by the aid of Grignard's reagents; Theoretical; Zinc organometallic compounds; Bibliography.

**WRIGHT, ARTHUR.** Filtration. To be published by The Chemical Catalog Co., Inc. Ready about July 1, 1922.

**WRIGHT, C. R. ADLER.** Animal and Vegetable Fixed Oils, Fats, Butters, and Waxes. Edited and partly rewritten by C. Amesworth Mitchell, B.A., F.I.C. Their preparation and properties, and the manufacture therefrom of candles, soaps, and other products. Third edition. 804 p. 8 vo. il. 1921. \$16.50

CONTENTS: Part I. General composition and nature of oils, butters, fats, waxes, and allied substances. The sources and general nature of natural and artificial oils. Alcoholiform saponification products of oils, fats, waxes, etc.

Part II.—Physical properties of oils, fats, and waxes, etc.—General physical characters. Specific gravity and viscosity.

Part III.—Chemical properties of oils, fats, butters, and waxes.—Proximate constituents and the methods used for their examination and determination. Chemical reactions of oils, fats, etc., and their uses as tests of purity, etc. Quantitative reactions of oils.

Part IV.—Processes used for extracting, rendering, refining, and bleaching oils, fats, etc.—Extraction of oils from seeds, etc., by pressure or solvents. Animal fatty tissues. Extraction of oils and fats therefrom. Refining and bleaching animal and vegetable oils, fats, waxes, etc. Recovery of grease from "slops," etc.

Part V.—Classification and uses of fixed oils, fats, waxes, etc.; Adulterations.—Classification. Principal uses of oils and fats, etc. Adulteration of oils and fats.

Part VI.—The candle industry.—Materials used in candle making. Manufacture of candles, tapers, and night lamps.

Part VII.—The soap industry. Materials used in the manufacture of soap. Soap-making plant. Manufacture of soap. General chemistry of soap.—Soap analysis. Glycerol extraction.—Manufacture of glycerine.

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CONTENTS: Alcohol its various forms and sources. Mashing, cooling and fermentation in general. Distillation, simple forms of stills, the production of alcohol from wine, Malt. Alcohol from potatoes, mashing, fermentation, distillation, continuous stills. Alcohol from grain. Alcohol from beets. Alcohol from sorghum and molasses. Denatured alcohol and its commercial uses. Alcoholometry. Tables.

**WYER, S. S.** Treatise on Producer Gas and Gas Producers. Second edition. 308 p. 8 vo. il. 1907. \$4.00

Based on a series of articles in the *Engineering Magazine*. The author is a well-known consulting engineer specializing in producer gas and natural gas.

**WYNNE, W. E., and SPRARAGEN, W.** Handbook of Engineering Mathematics. Second edition, revised and enlarged. 290 p. 12 mo. il. 1916. Flexible "Fabrikoid." \$2.50

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**WYSOR, H.** Analysis of Metallurgical and Engineering Materials. A systematic arrangement of laboratory methods. By Henry Wyssor, B. S., Assistant Professor of Analytical Chemistry and Metallurgy in Lafayette College, Consulting Chemist and Metallurgist. 82 p. 4 to il. 1912. \$2.00

CONTENTS: Introduction. Sampling ores by hand. Specific gravity of solids. Analysis of limestone. Analysis of Portland cement. Analysis of coal and coke. Analysis of iron ore. Analysis of chrome iron ore. Analysis of manganese ore. Analysis of copper ore and matte. Analysis of lead ore and steel works residues. Analysis of iron. Analysis of alloy steel. Analysis of ferro-manganese and iron rich in manganese. Analysis of brass and bronze. Analysis of soft bearing metal. Analysis of water. Analysis of producer gas. Calorimetry of coal, coke and oil. Calorimetry of gases. Examination of lubricating oil. Examination of the microstructure of iron and steel. Heat treatment of metals. Atomic weights. Gravimetric factors. Bibliography.

**YATES, R. F.** How to Make and Use a Small Chemical Laboratory. 102 p. 12 mo. 1920. \$0.75

**YENSEN, TRYGVE.** Magnetic and Other Properties of Iron-silicon Alloys Melted in Vacuo. 67 p. 8 vo. 1915. \$0.35

Bulletin 83 of the Engineering Experiment Station of the University of Illinois.

**YOUNG, SYDNEY.** Stoichiometry. Third edition. 277 p. 8 vo. il. 1919. \$4.20

**ZERR, GEORGE, and RUBENCAMP, DR. R.** A Treatise on Color Manufacture. A guide to the preparation, explication, and application of all the pigment colors in practical use. Authorized English edition by Dr. Charles Mayer. 605 p. 8 vo. il. 1908. \$11.50

CONTENTS: (A) The artificial mineral colors.—Part I.—General remarks on the establishment of a color works. General preparation of the materials. Part II.—The manufacture of the artificial mineral colors.—White mineral colors. Yellow mineral colors. Blue mineral colors. Green mineral colors. Red mineral colors. Brown mineral colors. Part III.—The raw materials used in color-making. I.—Natural mineral colors in general. The chief processes in the treatment of natural mineral colors. Part II.—White earth colors. Yellow earth colors. Red earth colors. Green earth colors. Brown earth colors. Grey earth colors. Black earth colors.

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**ZERR, GEORGE.** Tests for Coal-tar Colors in Aniline Lakes. A review of the coal-tar coloring matters generally used in the lake industry, and their behavior with distinct chemical reagents. Authorized English translation by Dr. Charles Mayer. 230 p. 8 vo. 1910. \$6.00

CONTENTS: Part I.—Introductory. Reactions of aniline lakes.—Yellow and brown lakes. Orange lakes. Red lakes. Violet lakes. Blue lakes. Green lakes. Appendix tables. Part II.—General. Classification of coal-tar color lakes according to solubility. Reactions with hot water. Reactions with alcohol. Reactions with acetic acid. Precipitated coal-tar colors soluble in hot water, alcohol, and acetic acid; Soluble in hot water and alcohol, insoluble in acetic acid; Soluble in hot water and acetic acid, insoluble in alcohol; Soluble in hot water, insoluble in alcohol and acetic acid; Soluble in alcohol and acetic acid, insoluble in hot water; Soluble in alcohol, insoluble in hot water and acetic acid; Soluble in acetic acid, insoluble in hot water and alcohol. Insoluble in hot water, alcohol, and acetic acid. Reactions of the coal-tar color lakes with sulphuric acid. 66Be. Reactions of the coal-tar color lakes with caustic soda. Remarks. Example of an analysis of a lake containing only one coloring matter. Standard lakes. Preparation, stocking. Application. Reactions of the coal-tar color lakes with a tin salt solution. Examples of analyses of combined coal-tar color lakes. Coal-tar color lakes specially fast to light. Index.

**ZIEGLER, VIOTOR.** Popular Oil Geology. Second edition. 191 p. 12 mo. il. 1920. \$3.00

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CONTENTS: Continuous handling material. Intermittent handling of material. Unloading and loading appliances. Miscellaneous installations.

**ZIMMER, GEORGE F.** Mechanical Handling of Material and Its National Importance During and After the War. 138 p. 4 to. 1919. \$4.00

CONTENTS: Introduction. Pneumatic Handling. Ash Hoists. Mono-Rails. Storing of Coal. Conveyors and Elevators and Their Suitability for Different Uses. Telphers. Terminal Plant. Mechanical Equipment of Boiler-Houses. Pneumatic Ash Conveyors. Mechanical or Automatic Stokers. Handling of Material in Gas Works. Floating Loading Devices. Importance of Coaling Under Way. Oil Fuel Bunkering at Sea. Mechanical Trimming of Coal in Bunkers. Portable Loading and Unloading Devices. Coaling Locomotive Engines. Concluding Remarks. The principal object of this work is to explain to those responsible for the output in industrial establishments how to replace men by machines. Examples of systems and plants in operation are described in the hope that some will be found applicable, with modification, to existing establishments.

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CONTENTS: The cacao tree. The manufacture of cacao preparations; Ingredients used in the manufacture of chocolate; Examination and analysis of cacao preparations; Installation of a chocolate and cacao powder factory.

**ZSIGMONDY, R.** Chemistry of Colloids. Part I. By Richard Zsigmondy. Authorized translation by Ellwood B. Spear, Associate Professor of Inorganic Chemistry, Massachusetts Institute of Technology. Part II. Industrial Colloidal Chemistry. By Ellwood B. Spear, B.A., Ph.D.; with a chapter on Colloidal Chemistry and Sanitation by John Foote Norton, S.B., Ph.D., Department of Bacteriology, University of Chicago. 288 p. 8 vo. il. 1917. \$3.00

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**ZSIGMONDY, R.** Colloids and the Ultramicroscope. A manual of colloid chemistry and ultramicroscopy. By Richard Zsigmondy, Professor of Inorganic Chemistry in the University of Gottingen. Authorized translation by Jerome Alexander, M.Sc. 245 p. 8 vo. il. 1914. \$3.00

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